OCTOBER 4, 1954

Sales & Service — Residential • Rural • Commercial . . . page 114

Electrical World

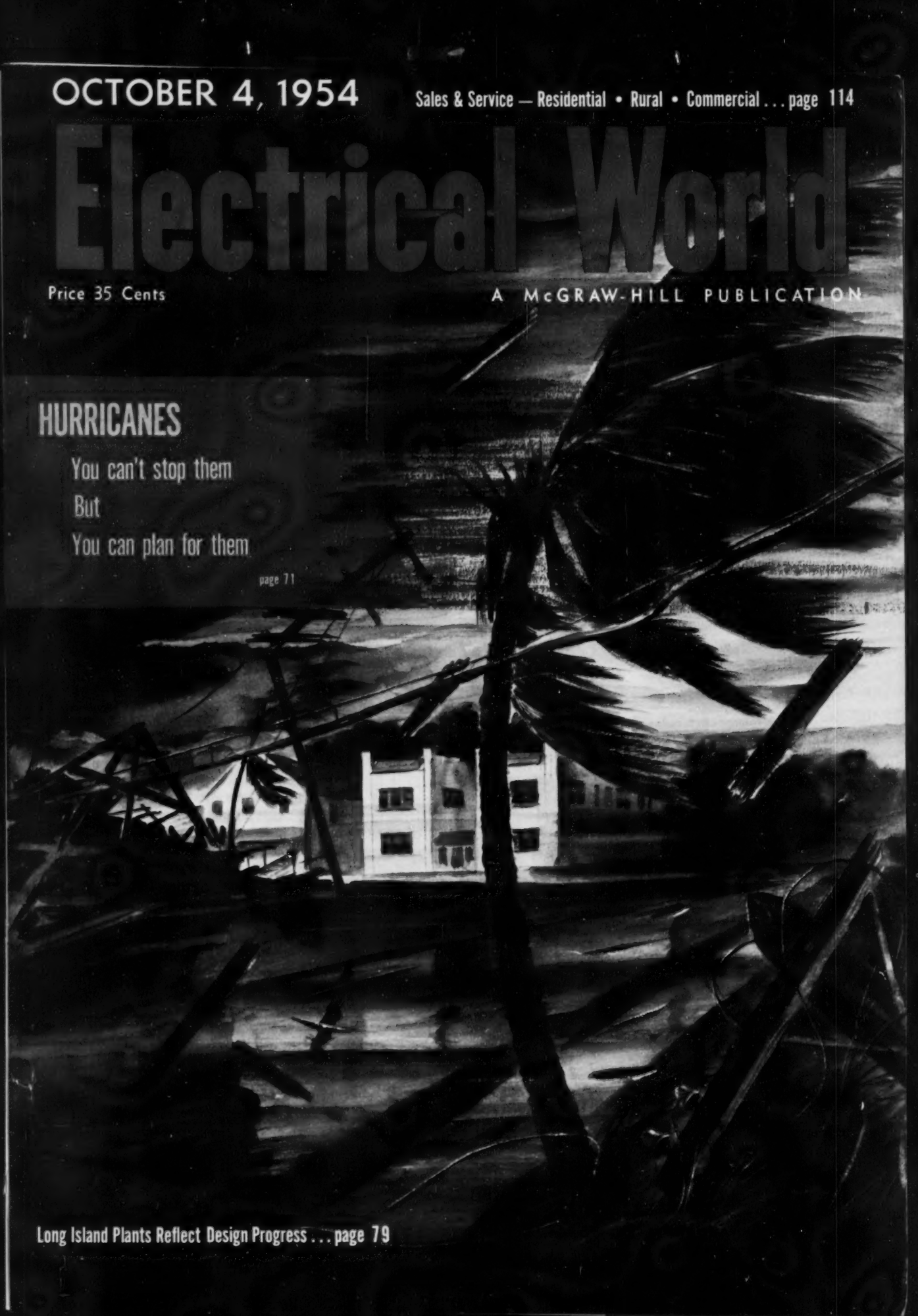
Price 35 Cents

A McGRAW-HILL PUBLICATION

HURRICANES

You can't stop them
But
You can plan for them

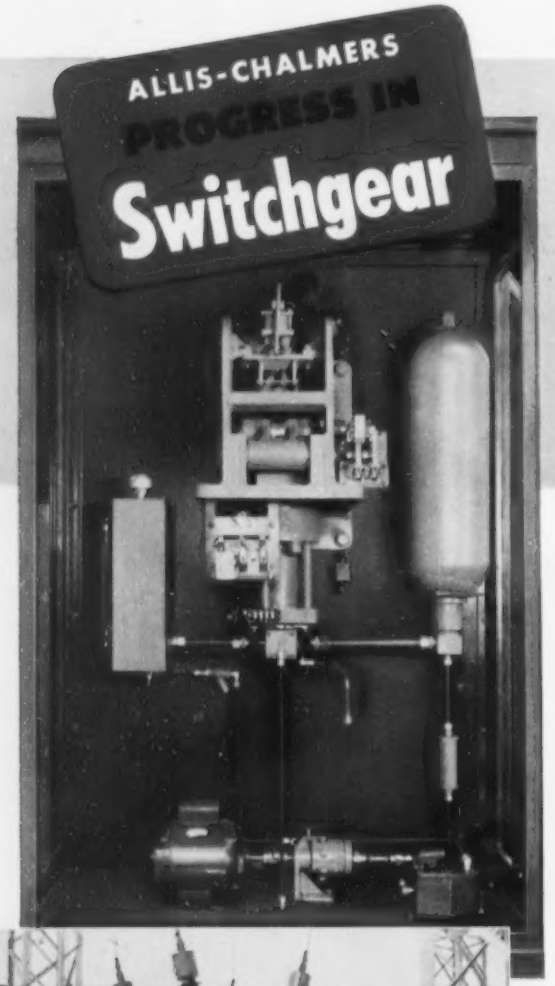
page 71



Long Island Plants Reflect Design Progress . . . page 79

"Pneu-Draulic" Operating Mechanism for Breakers

Looks Simple...IS SIMPLE!



Only 1 adjustment in hydraulic system...
to position the spool valve.

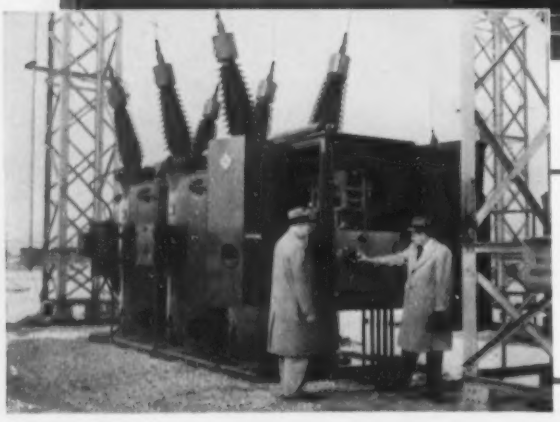
Only 2 moving parts in hydraulic control...
the spool valve and its control.

This simplicity of design was an important factor in the performance of *Pneu-Draulic* operators during the past year at an eastern power company. But this is only one part of the story of simplicity. It's simple to maintain as well.

Note the wide open accessibility — the short lengths of pipe — the few parts. In addition, the system eliminates basic causes for maintenance. Dirt hazard is eliminated. In effect, it's a sealed system with efficient filtering. Corrosion problems are reduced, since oil in the system uses one of the best corrosion inhibitors known. Moisture condensation problems are eliminated, since the system is filled with oil. Even manual closing is simpler, because provision for manual closing is built in.

Find out more about the breakers with the *Pneu-Draulic* operating mechanism. Call your nearby A-C office, or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-4375

Pneu-Draulic is an Allis-Chalmers trademark.



New Operator Mechanism Has Excellent Record

Four 115-kv Allis-Chalmers circuit breakers at an eastern power company have operated almost a year with a total of over 4000 operations.

ALLIS-CHALMERS

Electrical World

Vol. 142 No. 14 October 4, 1954

EDITORIALS—Pertinent comment on the industry's problems and accomplishments 53

THE ELECTRICAL WEEK—Last minute news briefly told 55

NEWS—Complete coverage of activities affecting the industry 57

FEATURES:

BUNDLING METHODS AND COSTS PROVED IN LOUISIANA
W. L. Rush, Gene Lancaster 68

HOW FLORIDA P&L RESTORES SERVICE
George Kinsman, J. A. Lasseter, J. W. Beville, Jr 71

HOW TEMPERATURE AFFECTS LOAD ..... Edwin Fleischmann 75

LONG ISLAND PLANTS REFLECT DESIGN PROGRESS ..... William Welch, Jr 79

RESIDENTIAL SECONDARY CAPACITOR ECONOMICS
J. J. Heagerty, N. M. Neagle 82

STATISTICS—The industry's progress in figures 65

FINANCIAL—News of securities and financing 66

HOW TO—Practical ideas for those who design, construct, operate, and maintain 85

INDUSTRIAL APPLICATIONS
—Successful applications of electricity in industry 108

SALES AND SERVICE—Commercial, rural, and residential uses of electricity .. 114

MANUFACTURERS & MARKETS—Information on electrical manufacturers and today's markets 120

NEWS ABOUT PEOPLE—Personnel changes throughout the industry 162

• • •

Readers Forum 56
Meetings Calendar 63
Washington Comment 64
Technical Notes 64
Engineering Reference Sheet ... 96
New Equipment 140
Catalogs and Bulletins 150
Technical Literature 156
Books 158
Index of Advertisers 172

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ELECTRICAL WORLD

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- **TERMITE-PROOF**
- **INSECT AND RODENT RESISTANT**
- **LIGHT WEIGHT**

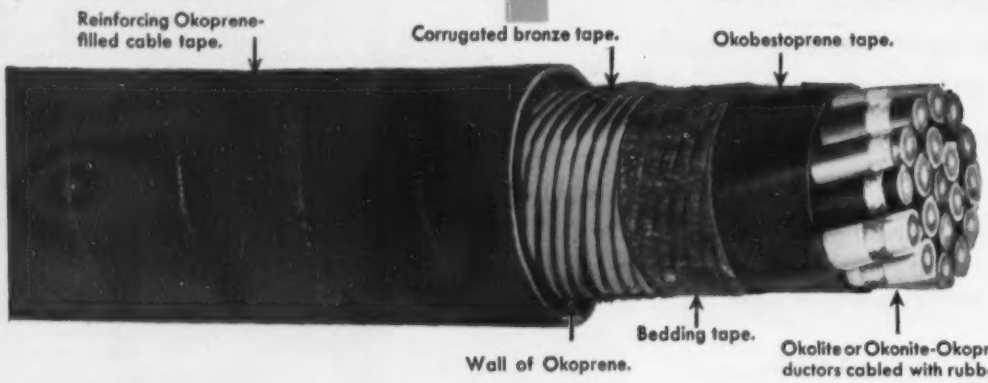
New!

OKONITE

CB-OT

CABLE

for direct burial installations



CB-OT is a light-weight, metallic-tape armored protective covering designed to sheath multi-conductor signal, control and power cables directly buried in the earth. It consists of a 5-mil corrugated bronze tape and a wall of Okoprene reinforced with an Okoprene-filled cable tape.

The corrugated bronze tape provides extra strength in the composite sheath. The corrugations give exceptionally high compressive strength which is a prime consideration in direct burial applications. It constitutes an excellent termite and insect barrier and provides mechanical protection against attack by gophers, rodents and small animals. It contributes to the moisture resistance of the cable and prolongs its life in underground service.

This light-weight construction is much more flexible than the conventional metallic type parkway finish. Unlike flat-taped constructions, this design can be bent around a radius close to that of its own diameter without buckling the metal tape and causing damage to the insulation.

At terminations the corrugated bronze tape is easily unwrapped. The small bending radius enables CB-OT sheathed cables to be trained in congested junction boxes or relay cases and allows simple terminations where space is restricted.

For prices or more detailed information contact The Okonite Company, Passaic, New Jersey.

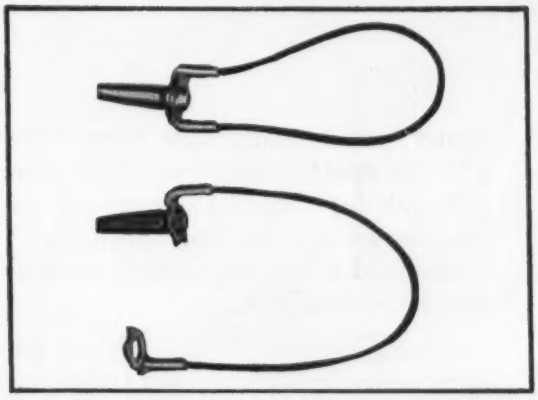
Write for Bulletin 1086 for more complete information.

OKONITE *insulated cables*

2650

Electroline AUTOMATIC DEAD-END

for Neutral Supported Multiple Conductor Service-Drop Cable



THE 4000 SERIES ANCHOR BRACKET

This Electroline Automatic Dead-End is designed for use with neutral-supported type of service drop. The insulation on the phase wires is not destroyed because these Dead-Ends grip only the bare neutral. This eliminates the possibility of shorting any phase. Available only for No. 6-AWG conductor. For automatic line Dead-Ends use the Electroline 3400 Series.

THE ELECTROLINE 3800 SERIES Automatic Dead-Ends lower construction costs because they are easily installed in a few seconds. This Dead-End is assembled as a one-piece unit with no loose parts to be dropped or lost. One end of the flexible bail is detachable for use with a spool-type insulator or other types of supporting anchorages now in service. This feature permits quick and easy installation with only one part, other than the conductor, to be handled by the lineman.

ELECTROLINE 4000 ANCHOR BRACKET — The 4000 Series Service Bracket, for use on permanently multi-grounded neutral systems (ideal for use with 3800 Series Dead-Ends as illustrated below), permits quick and simple insertion of a closed bail or loop—supports the cable at any angle. Installation costs are further reduced since this method of anchoring eliminates the insulator and insulator hardware.

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ARE YOU SECTIONALIZING YOUR FEEDERS AT

Now the simpler operating methods possible with S&C Load Interrupters can save equipment costs at sectionalizing points by almost one half.

S&C Load Interrupters can switch the circuit *without any external arcing.*

This means you can now use stick operation at many points where the present practice is group operation . . . group operation perhaps for the single purpose of actuating disconnects or horn-gaps when mounted upright at pole-top locations to give the necessary clearances for their rising arcs.

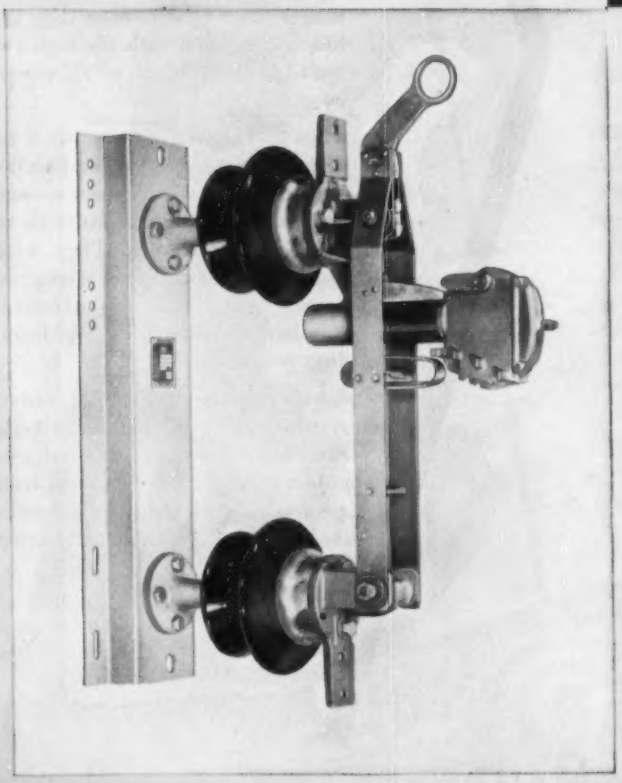
With the stick-operated* Load Interrupter, you actually save three ways: (1) No costly operating mechanism and pole-top frame to purchase; (2) Installation labor radically lowered; (3) Maintenance and adjustment costs reduced to a minimum.

Of course this cost-saving is just part of the story. Since the Load Interrupter can switch the circuit under any condition except short circuit, it permits completely new practices in switching distribution feeders.

**However, S&C Load Interrupters may also be obtained for group operation.*

Would you like to read more about the S&C Load Interrupter and how it saves money while improving operating practices? Write today for Catalog Section 760.

DISTRIBUTION LOWEST COST?



Inverted Interrupters are readily accessible for operation with a hook stick.

Single-pole Load Interrupters for vertical mounting—14.4 kv 600 amp.

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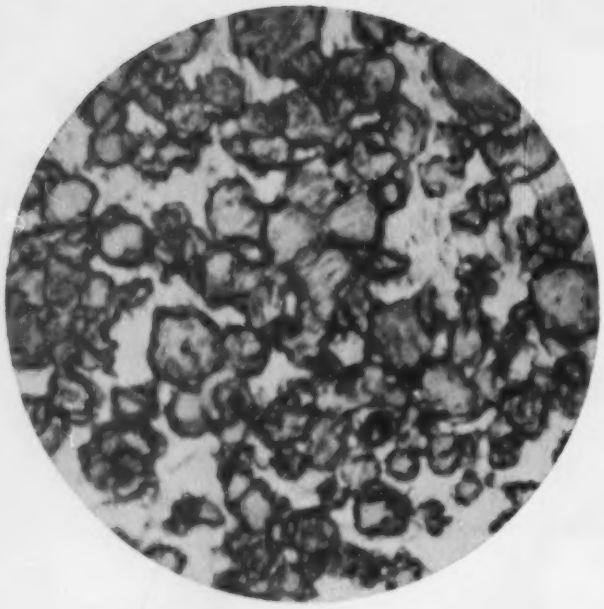

Close-Up Of A Reason Why

ELKONITE® Contacts

Have No Equal

Here, magnified over two thousand times, is one of the reasons why Elkonite contacts give such long, dependable service in heavy-duty power-interrupting equipment.

This photomicrograph illustrates the type of structure found in copper Elkonite. Note the even distribution, and how the copper (white area) fills the interstices of a sintered tungsten (dark area) compact.

The unique Elkonite process, developed by Mallory, combines metals which will not alloy. The arc-resistance of refractory metals, such as tungsten, molybdenum or their carbides, is merged with the high current-carrying ability of copper or silver.

Thus Elkonite contacts offer the designer an unequalled combination of good conductivity, impact strength and hardness, and resistance to arc erosion and sticking. They withstand severe short-circuit arcing conditions, and are the accepted standard for interruption of heavy duty arcing loads.

A wide selection of Elkonite contact materials is available to suit the exact requirements of your own product design. For complete technical data, write today for a copy of the new Mallory Contact Catalog.

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Costs Less because it Lasts Longer

You save money by using non-rusting Copperweld* Strand because you pay for only one guy installation during the life of the pole — costly replacements are eliminated. Certainly, this is important — for to replace just one rust-weakened or broken ordinary guy may cost you $100 or more, when you figure the outage and the items of labor, fittings and truck time — plus the cost of the new strand.

Once you put Copperweld Strand up, it's up to stay — its original high tensile strength remains permanent. When you consider its extra staying power, longer life and low overall cost, Copperweld is the most dependable and economical strand you can buy.

So, when it comes to guying, why not start economizing now by standardizing on Copperweld Strand all along your lines? Engineering Data will be sent you on request.

* *Trade Mark*

COPPERWELD STEEL COMPANY

WIRE AND CABLE DIVISION Glassport, Pa.

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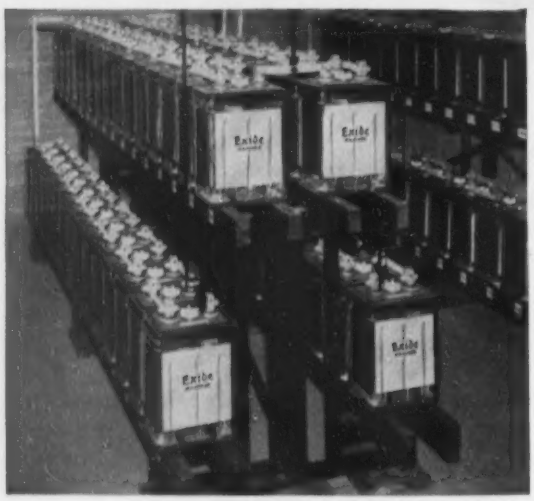
For Export: Copperweld Steel International Company, New York

The old Exide battery that lasted for 26 years.

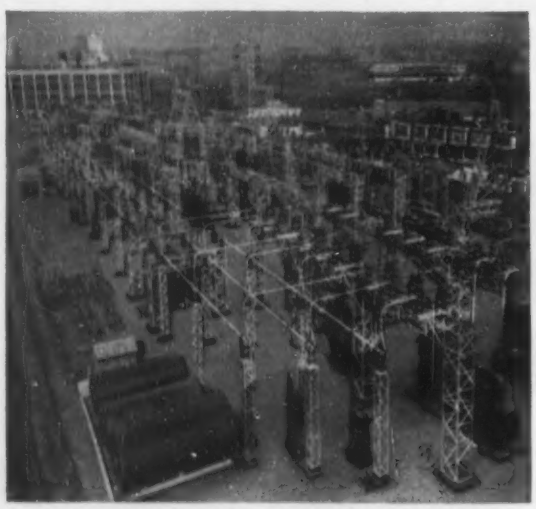
At The Philadelphia Electric Company
26 YEARS BATTERY SERVICE FROM

Exide®

BATTERIES



New installation of 120 EME-11 Exide-Manchex battery at the Westmoreland Substation.



Aerial view of The Philadelphia Electric Company's Westmoreland Substation. This is one of the largest switchyards on The Philadelphia Electric Co.'s system.

Twenty-six years of service—Another example of the long life of Exide batteries! Two 120 E-9 Exide batteries were installed at the Westmoreland Substation of the Philadelphia Electric Company—one in December 1927 and one in February 1928. In January 1953 the December 1927 battery (illustrated above) was replaced with 120 EME-11 Exide-Manchex. The other continues to provide dependable service! Exide-Manchex assures:

POSITIVE OPERATION: Dependable performance at ample voltage with no switchgear failures.

INSTANTANEOUS POWER: High rates for switchgear operation with adequate reserve power for all other control circuits and for emergency lighting.

LOW OPERATING COST: Extremely low internal resistance.

LOW MAINTENANCE COSTS: Water required about twice a year. No change of chemical solution during life of battery.

LOW DEPRECIATION: Sturdy, long-life construction.

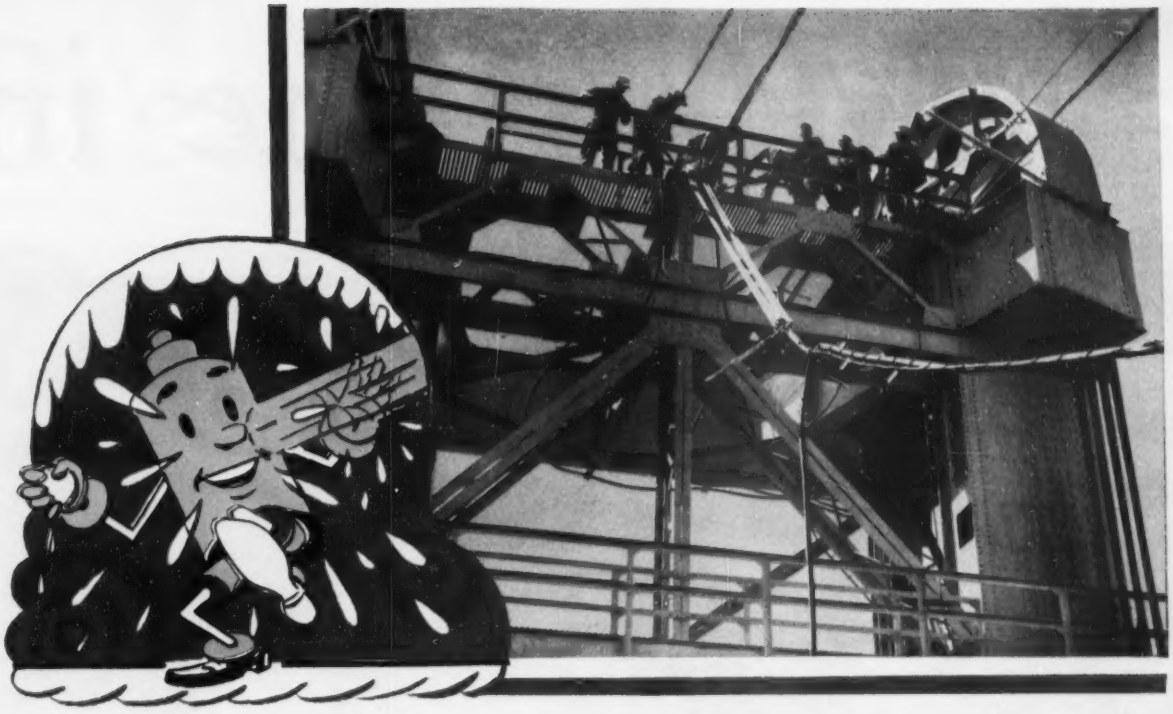
GREATER CAPACITY in a given amount of space avoids overcrowding.

• • •

Various sizes and types of Exide Batteries are available in plastic containers.

Exide-Manchex® is your best battery buy for all control and substation services.

Exide INDUSTRIAL DIVISION
The Electric Storage Battery Company
Philadelphia 2



ANHYDREX won't "CATCH COLD" when it's WET!

The Simplex Aerial Cable being pulled into position on this vertical lift bridge will eventually power and control lights, signals, and gate motors. Stretching 225 feet between two towers 220 feet above the water, the Anhydrex-insulated 27-conductor cable must stand high winds and frequent storms.

Since the utmost in dependability is required of this cable, low water-absorptive Anhydrex rubber-insulated compound was used. **No Anhydrex-insulated cable has ever failed from water absorption.** That's the kind of cable insulation needed on installations where moisture is a problem.

Each of the 12 No. 9 and 15 No. 12 stranded copper conductors in this cable is insulated with Anhydrex and coded for easy identification. After the conductors were cabled, a class "C" braid was applied and tarred. Then the cable was given a weather and flameproof finish.

It will stand severe whipping from wind, and continuous soaking from rain, fog, and dampness without failing. This means that train and auto traffic on this bridge will be well-regulated by dependable control equipment. If you want to know more about Simplex-ANHYDREX Aerial Cables, send for Catalog No. 1006.

Simplex-ANHYDREX insulated AERIAL CABLES

SIMPLEX WIRE & CABLE CO., 79 Sidney Street, Cambridge 39, Massachusetts

NEW Milestone in

50 YEARS TURBINE

ALLIS-

Steam Turbines

World's first close-coupled, cross-compound reheat turbine completes first year of operation, sets pattern for future power generation.

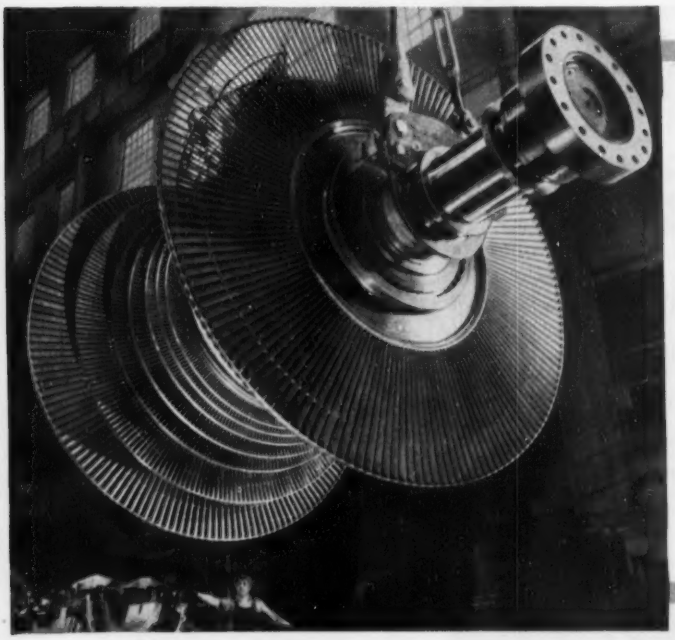
WISCONSIN ELECTRIC POWER COMPANY'S first unit at its new Oak Creek Station has proven design features that open new possibilities for steam turbine development. One additional Allis-Chalmers unit of the same type is being installed, another is under construction.

Close-coupled design makes a compact unit possible. It can be installed transversely or longitudinally in the turbine room with minimum crane span and still stay within space limitations of the boiler. End result is a smaller building with smaller turbine foundation. The entire unit rests on a single foundation. With the shafts so close together, oil piping can be reduced to a single feed and single drain line for both high and low speed machines. Steam piping is short and direct. A short "cross-under" carries steam from the intermediate pressure turbine to the center of the double-flow, low pressure 1800-rpm turbine.

Both high and intermediate pressure turbines operate at 3600 rpm, keeping the high temperature turbines favorably small in physical size. Primary steam to the high pressure turbine is at 1000 F, and reheat steam to the intermediate pressure turbine is also at 1000 F. The 120,000-kw unit generates two-thirds power at 3600 rpm and one-third at 1800 rpm.

You can depend on Allis-Chalmers for pace-setting turbine-generator units engineered to meet your requirements... in ratings up to 500,000 kw. For information, contact your nearby A-C representative or write Allis-Chalmers, Milwaukee 1, Wis.

A-4451



Longest Exhaust Blades

This cross-compound 3600/1800-rpm reheat turbine provides the large exhaust area needed for superior performance of high capability turbines. Its low pressure turbine operates with 40-inch blades, longer than any previously used. It operates at unusually low ½-inch exhaust pressure. The same low pressure turbine could be used at 1-inch exhaust pressure on a 250-mw unit. In addition, units of this type can be built in sizes up to 500 mw.

CHALMERS

A-C ALLIS-CHALMERS

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the electric power industry

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ARE YOU now realizing the greatest sales potential from your market area?

ARE YOU developing the demand for additional electric service through proven promotion methods?

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1879-1954 DIAMOND JUBILEE OF THE FIRST INCANDESCENT LIGHT

Oil for Edison's Magic Lamp_

and for the Power Plants that Light America's Cities Today!

SEVENTY-FIVE years ago, when the incandescent lamp was born, Thomas Edison relied on a Socony-Vacuum oil to protect the generating equipment that provided the electricity. Today, to commemorate the diamond jubilee of light, Edison's original equipment has been re-activated at the Henry Ford Museum and Greenfield Village near Detroit. And once again a Socony-Vacuum Oil has been chosen to protect it.

There is good reason for this choice. Socony-Vacuum lubricants for power plants have been the standard of quality for over 75 years. In fact, more turbines of 5,000 kw and over are lubricated by Socony-Vacuum than by any other oil company.

We are proud that, during these past 75 years, we were able to play a part in bringing the magic of Edison's lamp—and of electricity—to people throughout the world.

SOCONY-VACUUM

SOCONY-VACUUM OIL COMPANY, INC.
and Affiliates:
MAGNOLIA PETROLEUM COMPANY · GENERAL PETROLEUM CORPORATION

Series "C"...

OPERATING FEATURES

1. Bird-proof construction.
2. Easily re-fused with fuse hook (switch stick) when mounted vertically or 20° from vertical.
3. Fuse link leader securely held by positive grip thumb screw and snubbing post.
4. Double hinge mechanism pulls fuse link leader down and out of the tube. This insures quick clearing of low current faults.

CONSTRUCTION FEATURES

1. Conforms to latest NEMA Standards.
2. Has interchangeable fuse holders and load break fuse holders in heavy duty and extra heavy duty ratings. Also has interchangeable disconnecting blades.
3. For extra-heavy duty operation, expendable disc (easily replaced) blows out, giving additional relief to gas pressures built up under heavy faults.
4. Fuse holders use new color coding system, with reflecting tape to simplify night identification.
5. All non-ferrous parts (except for hanger strap).
6. Load break fuse holders use any melting type universal fuse link, even those where the element requires uncoiling before breaking.

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a new high degree of reliability

with the new

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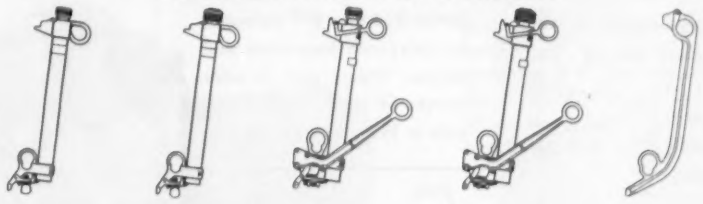
- **HIGHER INTERRUPTING CAPACITY**
- **POSITIVE LOAD INTERRUPTION**

One Heavy Duty Cutout for standard and Heavy Duty application at no increase in price.

FULLY INTERCHANGEABLE FUSE HOLDERS AND DISCONNECTING BLADE CONFORMS WITH NEMA STANDARDS



1	2	3	4	5
Heavy Duty Fuse Holder	*Extra-Heavy Duty Fuse Holder*	*Heavy Duty Load Break Fuse Holder*	*Extra Heavy Duty Load Break Fuse Holder*	*Disconnecting Blade*

INTERRUPTING RATINGS
(Amperes RMS)

Max. Kv Rating	Amp. Rating	Type of Fuse Holder	
		Heavy Duty	Extra Heavy Duty
5.2	100	5,000	10,000
7.8	100	5,000	10,000
15	100	4,000	8,000

The new NEMA 18 Kv (1200 amp.) cutout also available.

R&IE EQUIPMENT DIVISION
I-T-E CIRCUIT BREAKER CO.
GREENSBURG, PA.

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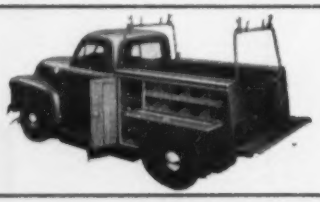
The 1 Source
for utility bodies and equipment!

If your work calls for one service body or a hundred . . . if you can use standardized units or require custom-made equipment . . . you'll find a body to fit your needs in the Powers-American line. Ladders, reels, racks, hooks, brackets, shelves, and other special items of equipment, can be furnished for your particular work requirements.

May we help you with your service body problems? Complete details will be sent upon request.

Series 44L and Series 44 (shown above) designed for any general service work. Fully-equipped with shelves and bins. For ½, ¾, 1, and 1½ ton chassis.

Series 25T and 35T arranged for telephone installation and service. Widely used in other phases of utility work. Available in ½ and ¾ ton sizes.



Series 25M and 35M used for all types of general service. Especially suitable for electric meter installation and maintenance. Models for ½ ton and ¾ ton vehicles.

Series 25G and 35G designed for use in the installation and servicing of gas meters. Equipped with meter hold-downs, bins, and pipe rack. In ½ and ¾ ton sizes.

POWERS-AMERICAN DIVISION

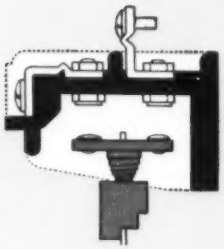
McCABE-POWERS AUTO BODY COMPANY

5900 NO. BROADWAY • ST. LOUIS 15, MO.
428 LATHAM SQ. BLDG. • OAKLAND 12, CALIF.

Bulletin 709 Starters are SO TROUBLE FREE

••• ••• *because they are* SO SIMPLE

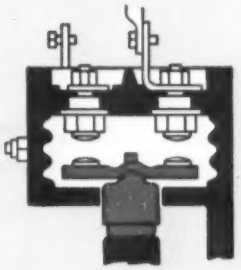
DOUBLE BREAK, SILVER ALLOY CONTACTS—NO MAINTENANCE



SIZES 0 & 1

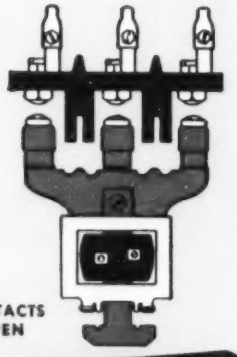
Some 20 years ago, when Allen-Bradley announced the new Bulletin 709 solenoid starter, a big feature was the change from single break, copper-to-copper contacts to double break, silver alloy contacts. A warning on the name plate said: DO NOT FILE, CLEAN, OR DRESS CONTACTS.

At first, maintenance electricians paid little attention to this request. Who had ever heard of running motor starters without contact maintenance? But, today, the dependability of Allen-Bradley starters is taken for granted. They have proved they are good for millions of trouble-free switching operations.



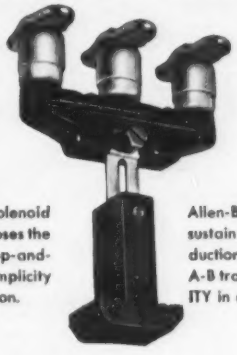
SIZES 2 TO 7

ONLY ONE MOVING PART—NOTHING TO RUST AND STICK

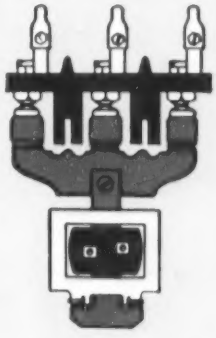


CONTACTS OPEN

The Allen-Bradley solenoid starter design was new and revolutionary in 1934. By doing away with clapper contactors, it eliminated hinged linkages, pivots, pins, and bearings. Only one moving part . . . the one-piece solenoid plunger . . . opens and closes the contacts with a simple up-and-down motion. Such simplicity assures unfailing operation.



Today, millions of Allen-Bradley solenoid relays, contactors, and switches are in active use. They have set a standard of performance which has expanded the use of automatic controls. Allen-Bradley solenoid controls sustain almost unbelievable production records. Look for the A-B trademark. It means QUALITY in motor control.



CONTACTS CLOSED

Under the same operating conditions a machine with many moving parts is more likely to develop trouble than a simpler machine with fewer moving parts.

The same rule holds true for motor starters. Most starters have complicated linkages, bearings, hinges, pins, and pivots in their mechanisms. Each moving part is a potential troublemaker.

Allen-Bradley Bulletin 709 magnetic starters are SIMPLE—they have ONLY ONE MOVING PART. If you want maintenance free motor controls . . . specify Allen-Bradley. Let us send you the latest A-B information—the A-B Handy Catalog.

Allen-Bradley Co.
1316 S. Second St., Milwaukee 4, Wis.

Bulletin 709 starters: Sizes 0 to 4. Sizes 5 to 7 not shown.
Max Rating: 300 hp, 220v; 600 hp, 440-550v.

ALLEN-BRADLEY

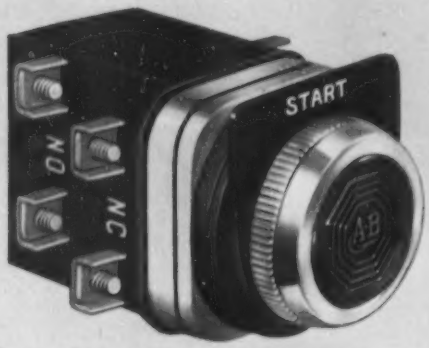
TROUBLE-FREE MOTOR CONTROLS

QUALITY

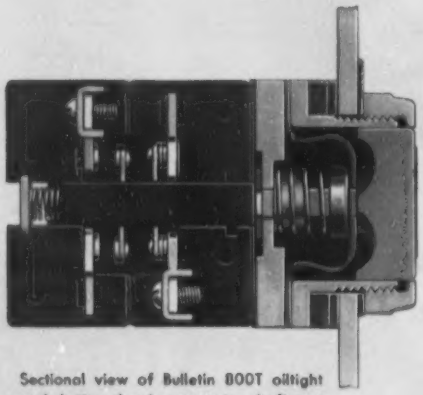
A-B Quality

B-84-M

OILTIGHT PUSH BUTTONS



Start Button with Double Pole NC and NO Contacts

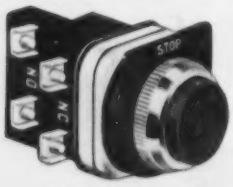


Sectional view of Bulletin 800T oiltight push button showing operator shaft carrying moving contacts. Stationary contacts are mounted in the molded contact block. The oiltight flexible diaphragm is between push button and contact block.

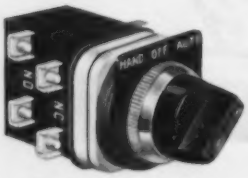
Here are a few of the many Allen-Bradley oiltight pilot units for machine tool service. They are available for mounting on machine frames in a variety of single units or in any combination of one or more units in oiltight enclosures. A flexible diaphragm, not affected by oil or cutting fluids, is inserted between button and contact block (see diagram at left) to prevent oil seepage into the contacts.

The silver alloy contacts are maintenance free. For complete information on the Bulletin 800T line, send for the new Allen-Bradley Handy Catalog.

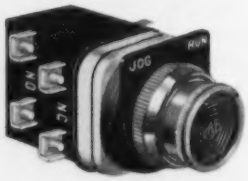
Allen-Bradley Co.
1316 S. Second St.
Milwaukee 4, Wis.



Type BA Stop Button



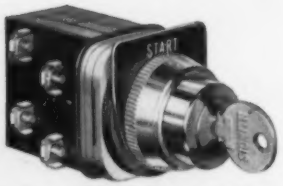
Type H2B Selector Switch



Type K2B Jog Button

Type 6PX Pendent Control

Bulletin 800T Type 2TA in Two-button Oiltight Enclosure



Type E11B Cylinder Lock Button

Type P26 Pilot Light

Assemble any combination of operators and contact blocks

OPERATORS

CONTACT BLOCKS

Bulletin 800T operators and contact blocks are available in many forms. They may be assembled interchangeably in various combinations, thus reducing your motor control parts inventory.

A-B

ALLEN-BRADLEY

QUALITY

MOTOR CONTROL

3-54-M

LOOK OUT, FIRE!

TWO OF THE GREATEST NAMES IN FIRE PROTECTION HAVE JOINED FORCES

PYRENE and C-O-TWO, world-renowned manufacturers of approved fire protection equipment, are now unified under the same management to give you the finest and most complete line on the market today . . .

- **built-in fire detecting systems that quickly respond to smoke, heat or flame . . .**
- **all types of portable fire extinguishers and built-in fire extinguishing systems that kill fire fast . . .**
- **plus an expert fire protection engineering service that gives you unbiased advice on what is best for your particular fire hazards.**

Don't take unnecessary chances . . . the combined fire protection experience of PYRENE and C-O-TWO over the years is at your disposal without obligation. Get complete facts today!

Pyrene

PYRENE — C-O-TWO

NEWARK 1 • NEW JERSEY

Sales and Service in the Principal Cities of United States and Canada

C-O-TWO

COMPLETE FIRE PROTECTION

portable fire extinguishers . . . built-in fire detecting and fire extinguishing systems

CARBON DIOXIDE • DRY CHEMICAL • VAPORIZING LIQUID • SODA-ACID • WATER • CHEMICAL FOAM • AIR FOAM

Utility company in Texas successfully combats corrosion with U. S. Uscolite Pipe in 6 of its plants

All 6 plants use chlorine to control slime growth in "cooling water." One of the 6 plants (shown below, in Corpus Christi, Texas) also uses chlorine to control marine growth in sea water used exclusively for cooling. In addition, this plant uses Uscolite pipe to combat another enemy—high salt content of soil which corrodes metal pipe from outside and causes failure. These are the reasons why the utility company changed from iron pipe (which lasted only 4 years) to Uscolite® pipe, which is expected to last 30 years. Unlike other piping, Uscolite is not attacked by chlorine or most chemicals, or even sea water.

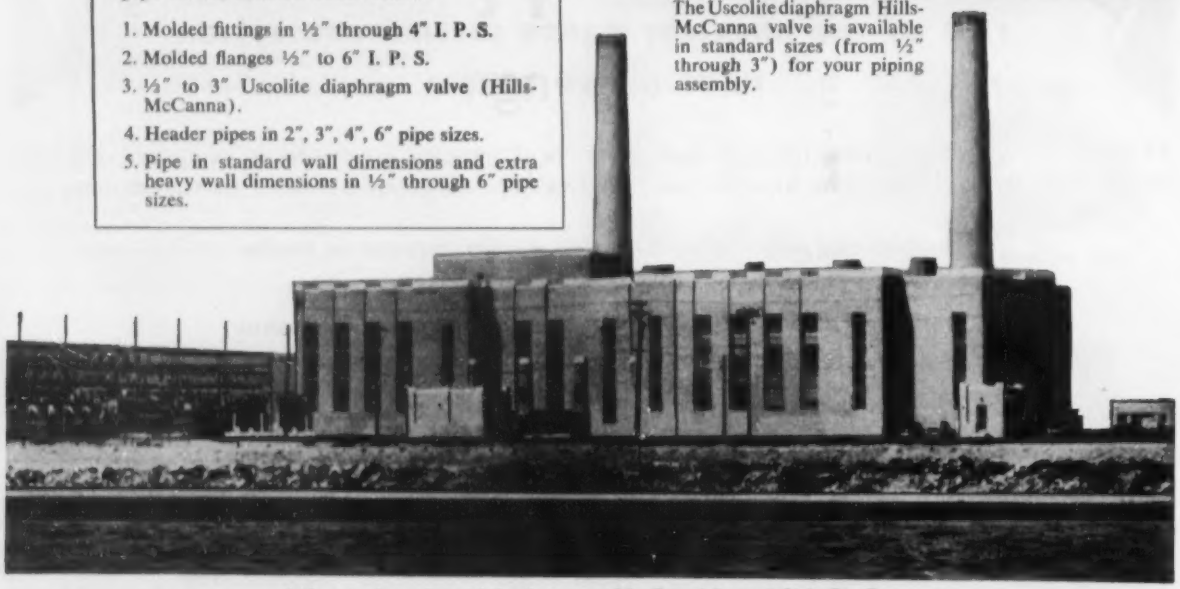
Uscolite is manufactured exclusively by United States Rubber Company. It has extremely high impact strength, high endurance, needs absolutely no maintenance, is very lightweight. It is available in standard lengths, and can be cut to length and threaded on the job.

Uscolite is the answer to corrosion and maintenance problems in piping. Any of the 27 "U. S." District Sales Offices will provide complete assistance and facts. Or get in touch with any of our selected distributors or write to address below.

Uscolite pipe and fittings come in the broadest and largest line of stock sizes of plastic pipe on the market. Sizes follow:

1. Molded fittings in ½" through 4" I. P. S.
2. Molded flanges ½" to 6" I. P. S.
3. ½" to 3" Uscolite diaphragm valve (Hills-McCanna).
4. Header pipes in 2", 3", 4", 6" pipe sizes.
5. Pipe in standard wall dimensions and extra heavy wall dimensions in ½" through 6" pipe sizes.

The Uscolite diaphragm Hills-McCanna valve is available in standard sizes (from ½" through 3") for your piping assembly.



*Above is photo of one of the plants, owned by Central Power & Light Co., Texas

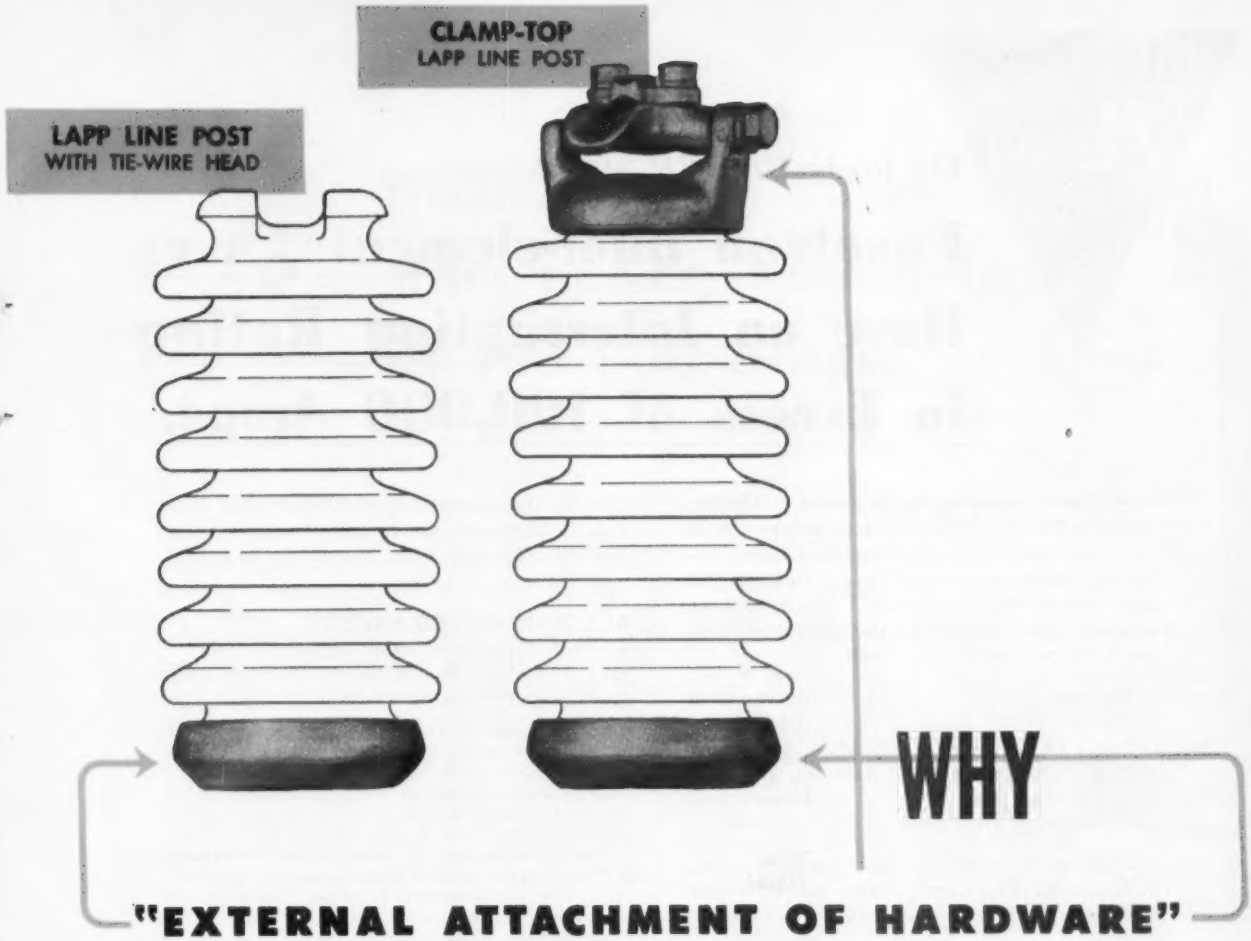
US RUBBER

"U.S." Research perfects it..."U.S." Production builds it...U.S. Industry depends on it.

UNITED STATES RUBBER COMPANY

MECHANICAL GOODS DIVISION · ROCKEFELLER CENTER, NEW YORK 20, N. Y.

Hose • Belting • Expansion Joints • Rubber-to-metal Products • Oil Field Specialties • Plastic Pipe and Fittings • Grinding Wheels • Packings • Tapes Molded and Extruded Rubber and Plastic Products • Protective Linings and Coatings • Conductive Rubber • Adhesives • Roll Coverings • Mats and Matting



"EXTERNAL ATTACHMENT OF HARDWARE"

means greater operating security for **YOUR** transmission lines

Characteristics of Lapp electrical porcelain include a compression strength of 100,000 lbs., a tensile strength of 5,000-8,000 lbs. Lapp Line Posts are designed to utilize the greatly superior compression strength, by *external attachment of hardware*. No nested porcelain parts . . . no pins . . . no inserts . . . no bursting forces . . . no small-area high-intensity tension loading of porcelain under thermal movement or mechanical loading. Instead, the large-area gentle-grip of externally attached bases and caps. This is the design which depends on the *compression* strength of *porcelain,* and the tension strength of steel. It's a fundamental in the Lapp concept of better insulator design. It is one of the ways Lapp builds transmission insulators to give you an extra margin of operating security, long life, and low upkeep.

Lapp

LAPP INSULATOR CO., INC., LE ROY, NEW YORK

Proven On loads *UNDER* 600 Amps . . . .

Fusetron dual-element Fuses Have an Interrupting Rating in Excess of 100,000 Amps.

An interrupting rating in excess of 100,000 amperes for FUSETRON dual-element fuses . . . this was shown by tests that were conducted under conditions that simulated the most severe field conditions. These tests were witnessed and verified by the Electrical Testing Laboratories of New York.

The test circuits were set to deliver far in excess of 100,000 amperes — yet the 250 and 600 volt FUSETRON fuses cleared the shorts without igniting readily flamable material placed around the fuses . . . and there was comparatively little noise.

These tests show that Fusetron fuses, even in the small 30 ampere range, can interrupt safely the most severe available short circuit current.

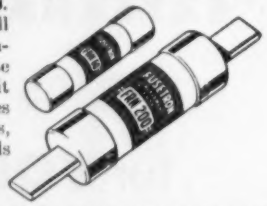
No interference with time-lag

Time-lag is of utmost importance to give proper motor and electrical protection and to eliminate needless blowing of fuses. Even though the interrupting capacity has been greatly increased, the time-current characteristic of Fusetron fuses has in no way been disturbed.

ALL THIS ADDED SAFETY

without changing a panelboard or switch . . . plus 10 point Protection of FUSETRON dual-element FUSES!

1. Protect against short-circuits. **2.** Protect against needless blows caused by harmless overloads. **3.** Protect against needless blows caused by excessive heating — lesser resistance results in much cooler operation. **4.** Provide thermal protection — for panels and switches against damage from heating due to poor contact. **5.** Protect motors against burnout from overloading. **6.** Protect motors against burnout due to single phasing. **7.** Give double burnout protection to large motors — without extra cost. **8.** Make protection of small motors simple and inexpensive. **9.** Protect against waste of space and money — permit use of proper size switches and panels. **10.** Protect coils, transformers and solenoids against burnout.



Fusetron Fuses Help eliminate needless Shutdowns for Production Engineers.

Work stoppages caused by needless blows are prevented. Even if all the motors on a circuit start at one time or other harmless overloads occur, the fuse link holds to prevent a shutdown.

Likewise, Fusetron fuses guard against needless blows caused by excessive-heating in panelboards and switches—lesser resistance results in cooler operation.

Fusetron Fuses Offer Maximum Safety for Electrical and Safety Engineers.

With an interrupting rating of 100,000 amperes, Fusetron fuses give the greatest possible protection against damage due to short-circuits. And just as important, they reduce the hazard of motor burnouts due to single phasing and overloading.

Fusetron Fuses Save Time and Work for Maintenance Engineers.

Once properly installed, Fusetron fuses require no costly inspection time or down-time for calibration and other maintenance necessary on mechanically operated devices.

Unnecessary repair work on motors is avoided because Fusetron fuses reduce to a minimum the danger of damage due to electrical faults. If trouble occurs, instead of rewinding or replacing burned out motors, simply replace Fusetron fuses.

Switches and panelboards are protected against damage from poor contact heating.

Fusetron fuses also protect against needless blows that cause irritating interruptions of regular maintenance.

Proven On loads *ABOVE* 600 and up to 5,000 Amps.

BUSS Hi-Cap Fuses Have an Interrupting Rating In Excess of 100,000 Amps. . . *and their blowing time can be coordinated with that of Fusetron fuses.*

An unlimited interrupting rating for BUSS Hi-Cap fuses on any voltage up to 600 . . . this was confirmed by tests reported by the Electrical Testing Laboratories of New York.

BUSS Hi-Cap fuses are designed to give protection against dangerous overloads as well as high fault currents — yet retain the speed of operation necessary to limit heavy short currents to safe values.

When coordinated properly with Fusetron dual-element fuses they will not open ahead of the fuse nearest to the fault — thus the trouble is isolated to the part of the circuit in which the fault occurs.

Added SAFETY on Old Installations

On installations where the increase in the capacity of the circuit has outgrown the interrupting rating of the circuit breakers, BUSS Hi-Cap fuses offer a safe and relatively inexpensive way to protect inadequate breakers against rupture in event of bad fault.

ACTION THAT SAVES YOU MONEY

Don't risk losses. Delay may cost you far more than replacing every fuse with a FUSETRON fuse. By passing the word along that all purchase and stock records should call for FUSETRON dual-element fuses on loads up to 600 amperes — and BUSS Hi-Cap fuses on loads above that, you get action that begets money saving.

On New Construction tell your architect to specify this Safer, Better Protection.

Fusetron Fuses Cuts Cost for Top Management.

Cuts maintenance cost — Fusetron fuses are maintenance free.

Cuts motor repair cost — Fusetron fuses guard the motor, against damage due to overloading, single phasing, short circuits and other electrical faults.

Cuts production costs — Shutdowns due to needless blows are eliminated.

Cuts new installation costs — Smaller sizes can be used, therefore big savings can be made on switches and panelboards.

Cuts present installation costs — Fusetron fuses hold and won't open on starting currents so the need for larger panelboards and switches is often eliminated — and in many cases new motors can be added to the circuit without installing larger panelboards or switches.

Play Safe—Install Fusetron Fuses and BUSS Hi-Cap Fuses now!

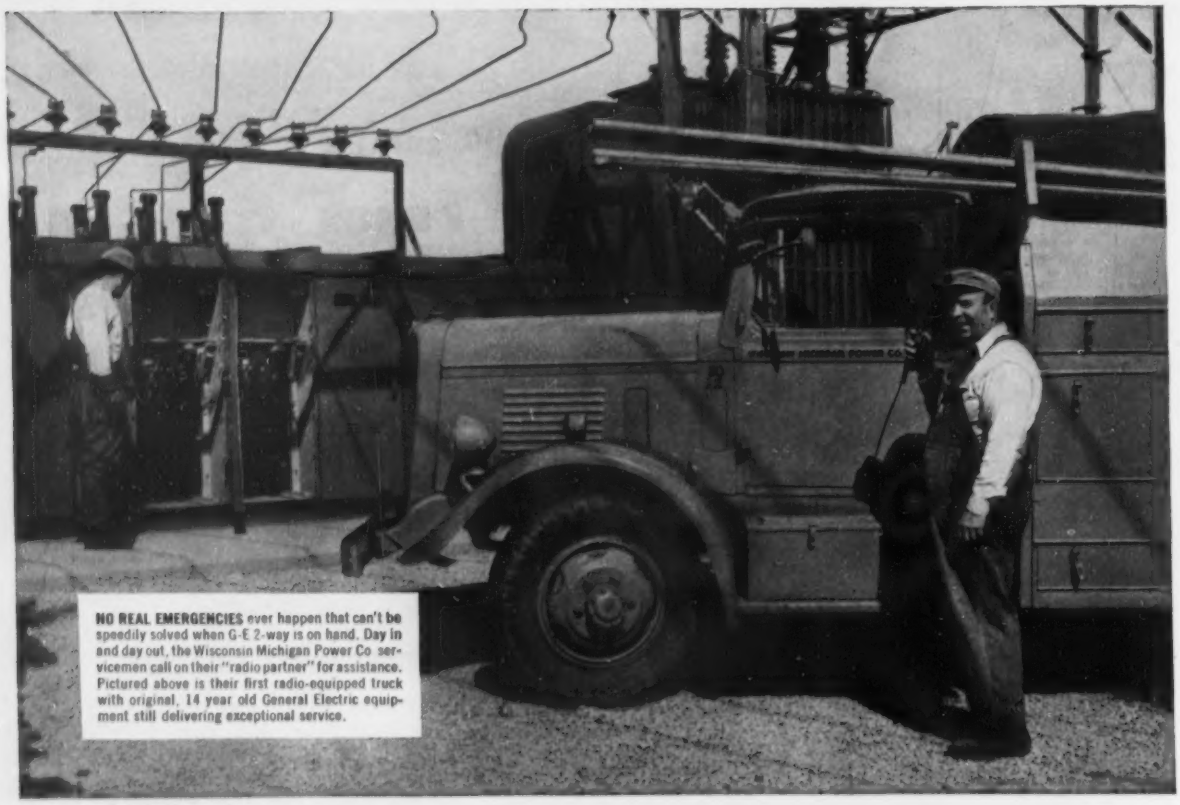
For blowing time charts or more information on FUSETRON fuses and BUSS Hi-Cap fuses use coupon or write for bulletin FIS and HCS.

FUSETRON
TRUSTWORTHY NAMES IN ELECTRICAL PROTECTION
BUSS

EW 10-54

BUSSMANN Mfg. Co.
(Division of McGraw Electric Co.)
University at Jefferson, St. Louis 7, Mo.
Please send me complete facts about FUSETRON dual-element Fuses and BUSS Hi-Cap Fuses.

Name_____
Title_____
Company_____
Address_____
City & Zone_____ State_____



NO REAL EMERGENCIES ever happen that can't be speedily solved when G-E 2-way is on hand. Day in and day out, the Wisconsin Michigan Power Co servicemen call on their "radio partner" for assistance. Pictured above is their first radio-equipped truck with original, 14 year old General Electric equipment still delivering exceptional service.

"LONG TERM PERFORMANCE RECORD PROVES G-E OUR BEST INVESTMENT!"

2-WAY MOBILE RADIO

FREQUENCY STABILITY & SELECTIVITY
guaranteed for life!

THAT's how an expert rates G-E 2-way radio! H. H. Brown, Chief Electrical Engineer, at Wisconsin Michigan Power Company, supports this high appraisal with the testimony of 14 years' service. The original installation in 1941 consisted of one 250-watt fixed station and three 30-watt mobiles. "Today, only one of these mobiles has been retired and we've *expanded with General Electric* to four fixed stations and 61 mobile units servicing two divisions."

Examine the advantages G-E 2-way offers and you'll quickly understand why it is *the preferred communication among utilities.* Get all the facts on G-E and then plan expansion. Ask your local Communications Counselor about the new "guarantee program" or, write: *General Electric Co., Section X19104-4, Electronics Park, Syracuse, New York.*

Progress Is Our Most Important Product

GENERAL ELECTRIC

AND EVERY HYLUG SIZE BETWEEN

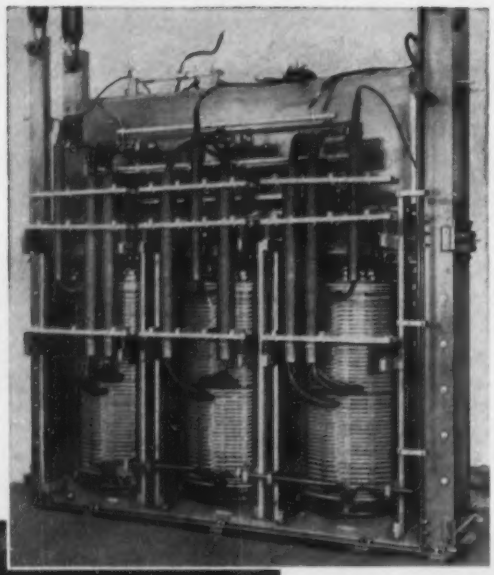
WITH TOOLS AND DIES FOR ANY SIZE

BURNDY

54-18

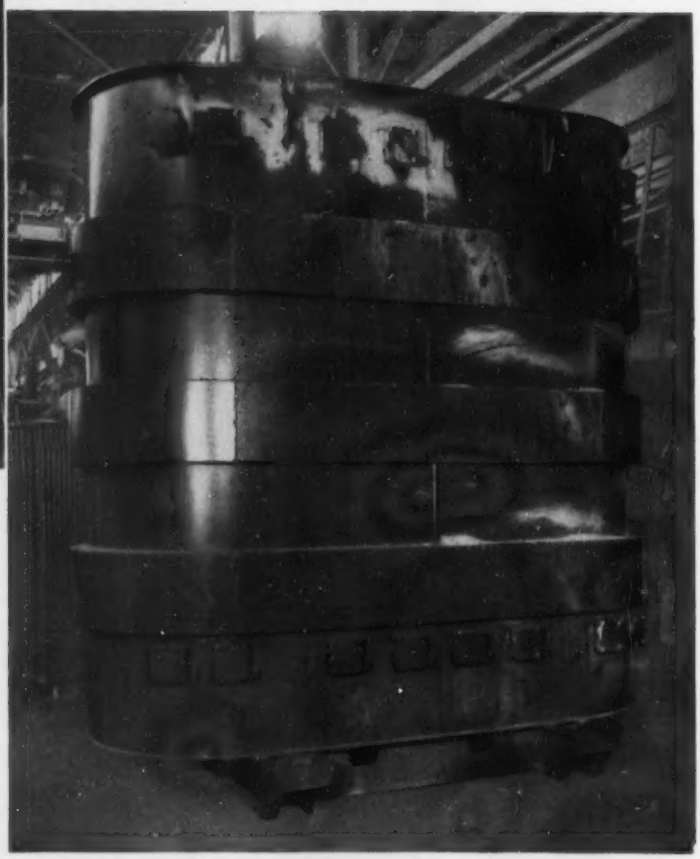
NORWALK, CONNET. • TORONTO, CANADA • *Factories:* NEW YORK, CALIF., TORONTO • *Export:* PHILIPS EXPORT COMPANY

We don't



● Electrical tests showed that no damage was done to the core and coils.

● Inspecting engineer points out damaged base member.



● Transformer tank withstood accident without damage.

● Load ratio control compartment was bent — but controls were undamaged.

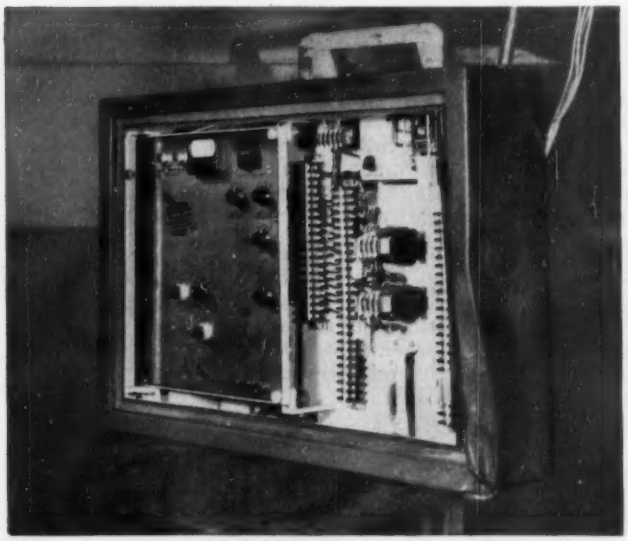
like Accidents,

but...look what an accident showed us about our design

When the bridge is too low and the transformer traveling toward it is too tall, something is bound to happen when the two meet. And something did happen!

A depressed center car, carrying a Pennsylvania 7500 Kva Load Ratio Control Transformer, was switched from one track to another and coupled to the wrong train. Then it met up with the concrete bridge! After the dust cleared away, the transformer and car were found turned over on their sides.

When returned to our shop, the transformer was thoroughly inspected. Electrical tests showed that no damage had been done to the core and coils. Damage inside the transformer was negligible — a broken bushing lead and a few cracks in some wooden supports. *That's all!* The internal damage was slight *because* the core-and-coil assembly was rigidly supported and held by the core clamping frames — even when the transformer fell over on its side.



Externally, the load ratio control compartment was distorted, but the controls were undamaged. Two mounting panels of the underload tap changing switch were cracked. The front of the switching compartment was distorted, as was the nitrogen cabinet. Some of the transformer base members were bent and cut, and the portion of the cover that hit the bridge was dented.

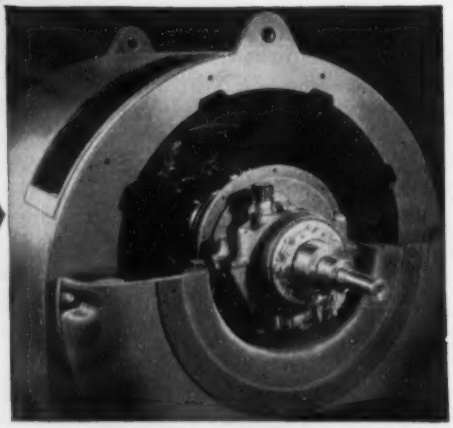
That was the sum total of the damage. Repairs were made and complete electrical tests showed the transformer to be in excellent operating condition. It was shipped back to its destination and this time it stayed on the right track.

We believe the negligible damage that resulted from this accident is substantial proof of the extra mechanical strength built into all Pennsylvania Power Transformers.

PENNSYLVANIA TRANSFORMER COMPANY
A McGraw Electric Company Division
CANONSBURG, PA. • Greater Pittsburgh District

new DESIGN...

more protection with full accessibility



* New Allis-Chalmers slip-ring motor with inspection cover and upper half of end shield removed. Note accessibility of brushes, protection of bearing.

ALLIS-CHALMERS LARGE SIZE SYNCHRONOUS AND WOUND-ROTOR MOTORS have been completely redesigned with longer stator yokes and shorter end shields. Collectors and brushes are located inside the yoke for protection against physical damage, dripping moisture, dust and dirt.

Capsule-type bearings give better bearing protection, too. The upper half of the end shield may be removed for inspection or cleaning of the interior of the motor without disturbing the exciter or exposing the bearing to the ravages of dirt, dust and oil contamination.

All leads enclosed — Both primary and secondary winding leads are brought out through separate conduit boxes. There is no loose wiring . . . no exposed leads anywhere.

Easy maintenance — Even though the new design offers maximum protection to brushes and collectors, internal parts are fully accessible for inspection and maintenance through large openings in the stator yoke. Opening covers are readily removed and are secured during operation by easy-operating, self-locking fasteners.

Get details now — This new design is available from approximately 250 hp at 300 rpm and up, in drip-proof and splash-proof construction. Call your Allis-Chalmers representative for complete details or write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 05R8183. A-4464

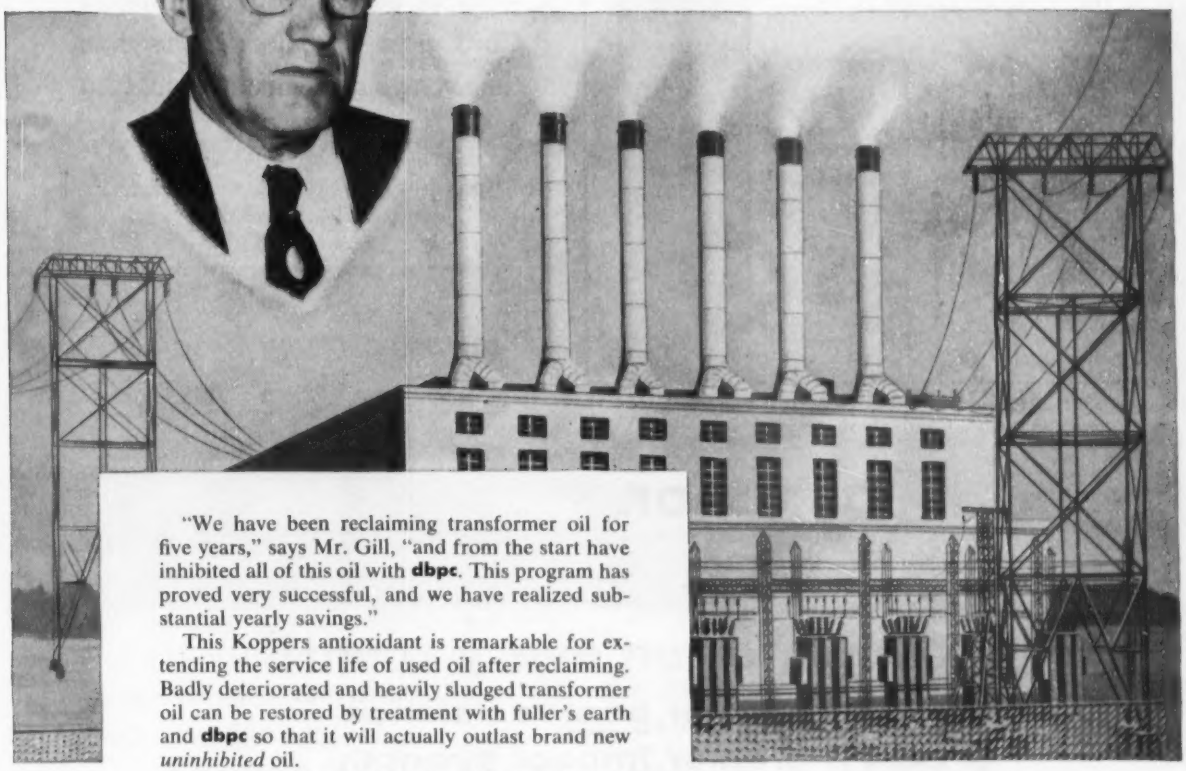
ALLIS-CHALMERS

"We've used dbpc® antioxidant for over 5 years to give our transformer oil long life and keep it sludge free"

says L. J. Gill

ASSISTANT TO SUPERINTENDENT

LINES AND SUBSTATIONS DEPT., PENNSYLVANIA POWER & LIGHT CO.



"We have been reclaiming transformer oil for five years," says Mr. Gill, "and from the start have inhibited all of this oil with **dbpc**. This program has proved very successful, and we have realized substantial yearly savings."

This Koppers antioxidant is remarkable for extending the service life of used oil after reclaiming. Badly deteriorated and heavily sludged transformer oil can be restored by treatment with fuller's earth and **dbpc** so that it will actually outlast brand new *uninhibited* oil.

Because of its exceptional performance in new transformer oil, all equipment manufacturers supply **dbpc**-inhibited oil as a standard item in their distribution units. Field tests prove that new transformer oil treated with only 0.3% of **dbpc** will last three to five times longer at a cost of less than .3 cent per gallon.

KOPPERS COMPANY, INC.

Chemical Division, Dept. EW-1044, Pittsburgh 19, Pennsylvania

SEND THIS COUPON FOR FURTHER INFORMATION

Koppers Company, Inc., Dept. EW-1044
Chemical Division
Pittsburgh 19, Pennsylvania

Please send me full information on the use of **dbpc** in transformer insulating oil.

Name.....Title.....

Company.....

City.....State.....

KOPPERS®

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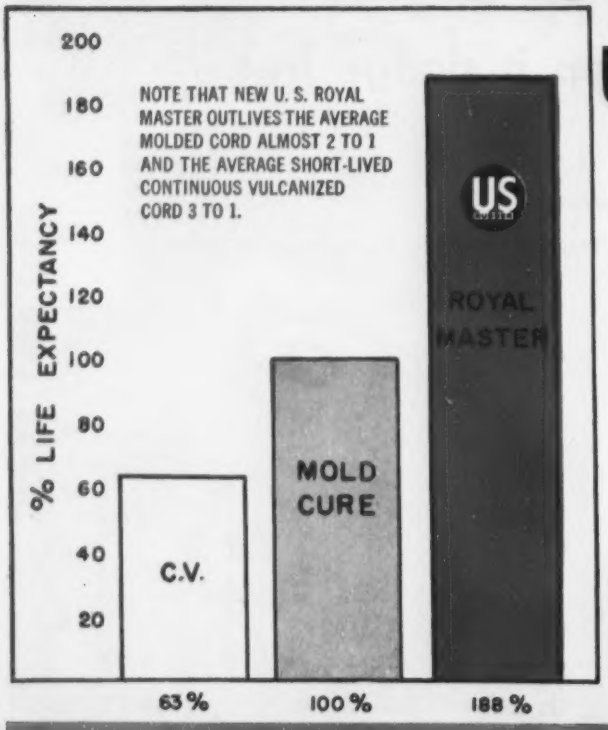
SALES OFFICES: NEW YORK • BOSTON • PHILADELPHIA • ATLANTA • CHICAGO • DETROIT • LOS ANGELES

Now...88% longer

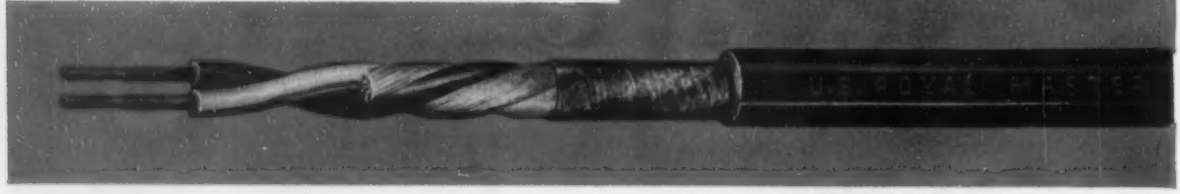
U.S. ROYAL



Chart—summarizing individual service factors weighted by their contribution to overall service life—shows new U. S. Royal Master Cord gives 88% longer life than the average of competitive molded cords.

LOOK FOR THE NAME—

U.S. ROYAL MASTER



Superior on every count!*

- 33.3% greater heat resistance
- 55.7% greater impact strength
- 53.8% greater abrasion resistance
- 30.6% greater resistance to cutting
- 110.3% greater resistance to tearing
- 21.2% greater tension or breaking strength
- 23.3% greater oil resistance
- 128.8% greater flexibility

*to the average of molded cords of other makes

US RUBBER

UNITED STATES

ELECTRICAL WIRE AND CABLE DEPARTMENT

cord life—with NEW MASTER portable cord!

Far outlasts *any* other cord made!

Service to cost ratings show new U. S. Royal Master Cord actually gives $1.88 in value for every cord dollar when compared to the average competitive molded cord!

Two years ago, "U. S." engineers began a *complete reexamination* of portable cord construction, service life, and the causes of cord failure.

Over 10,000 tests were made. More than a thousand cords of all leading makes, including our own famous U. S. Royal Cord, were analyzed, tested, and compared.

Every life factor was considered and carefully evaluated, alone and in its relation to overall cord performance and service life.

Backed by 64 years of experience in the manufacture of electrical wire and cable, U. S. Rubber engineers then translated their findings into an entirely new portable cord, designed to surpass any other previously made.

Extensive tests, both in the laboratory and in outside plant installations have proved this new portable cord startlingly superior in every respect!

New U. S. Royal Master is unquestionably the finest cord you can buy!

From every standpoint, new U. S. Royal Master is a finer, more durable cord — actually gives 88% longer life than the average of other molded cords — far longer than *any* other cord — surpassing even a *hypothetical* cord incorporating the best features of all those tested!

Far greater value, too! In spite of almost doubled service life, this great new cord is in the same price category as other molded cords—giving you $1.88 in cord value for every cord $1.00!

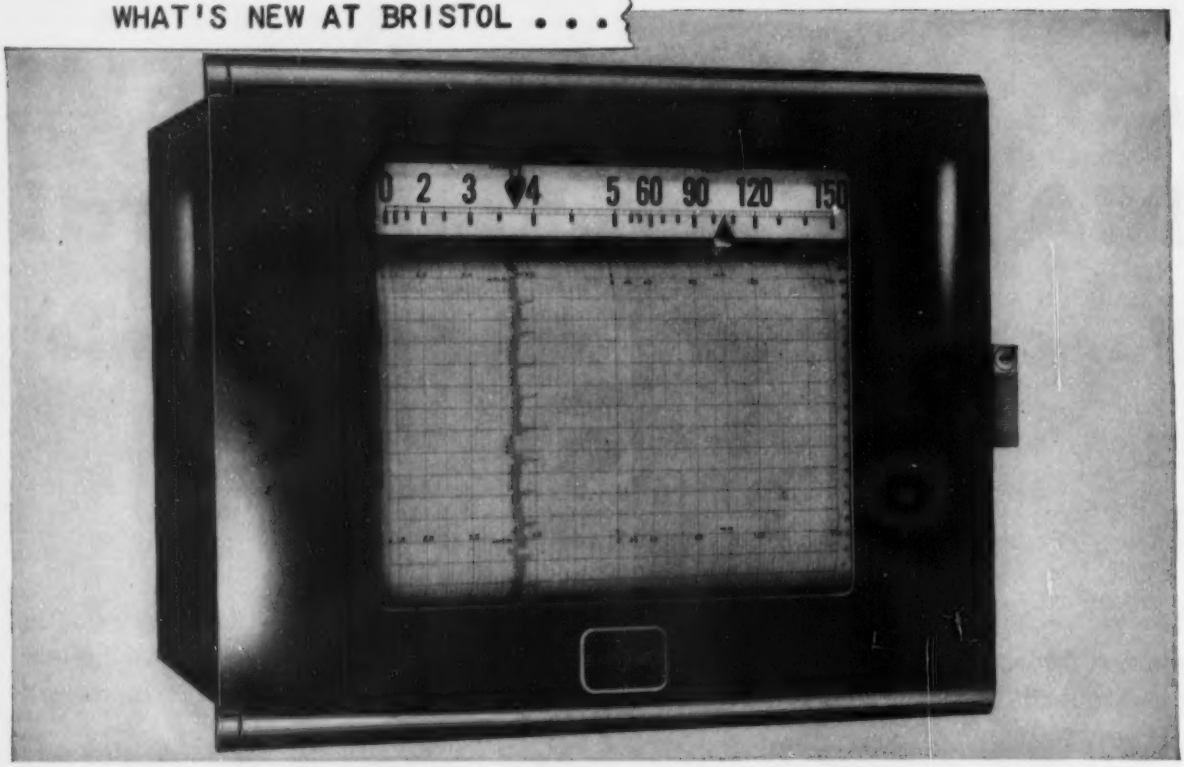
Prove to yourself the outstanding superiority of new U. S. Royal Master Portable Cord—in both service life *and* economy! Write address below for FREE descriptive booklet illustrating the superiority of the U. S. Royal Master Cord. And get in touch with your "U. S." distributor today!

Approved by Underwriters' Laboratories, Inc.

RUBBER COMPANY

ROCKEFELLER CENTER, NEW YORK 20, N. Y.

WHAT'S NEW AT BRISTOL . . .



Record current and voltage on one chart

with Bristol's Electronic Dynamaster Recording Voltmeter-Ammeter

THERMAL CURRENT and thermal voltage converters used with the Dynamaster Recording Voltmeter-Ammeter.

This two-pen strip-chart potentiometer records voltage and current simultaneously on the same chart. Measurements are made from a thermal voltage converter and a thermal current converter — a-c/d-c transducers with extremely high response speeds.

Here's what you get in this voltmeter-ammeter:

Accurate measurement: The Dynamaster is an accurate electronic instrument of simple, rugged construction. It is well suited for central station use under severe operating conditions, as well as for research and laboratory use.

Fast response: 2 seconds for full range pen travel. Every variation is recorded. Measurement is continuous.

Improved chart record: Two-zone, 12-inch strip chart with 11-inch calibrated width. Records are side-by-side — easy to read and compare, with expanded scales in the operating ranges. Chart speeds from ¾-inch per hour to 4-inches per second.

Kilowatt and Kilovar recorder: The Dynamaster is also available, using Bristol Thermoverter Transducers (thermal watt converters) as the primary elements, for recording watts and vars on a single two-zone chart.

Write for more information to The Bristol Company, 116 Bristol Road, Waterbury 20, Conn. 4.31

BRISTOL

POINTS THE WAY IN HUMAN-ENGINEERED INSTRUMENTATION

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

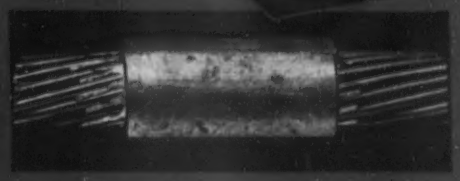
When Ignited-

THESE TWO COMBINE TO MAKE

The world's finest

ELECTRICAL CONNECTION

CADWELD®



Completed CADWELD connection

The Current Trend

IS

CADWELD

ERICO PRODUCTS, INC.

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ERICO PRODUCTS, INC.

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☐ Send Descriptive Literature on CADWELD Electrical Connections

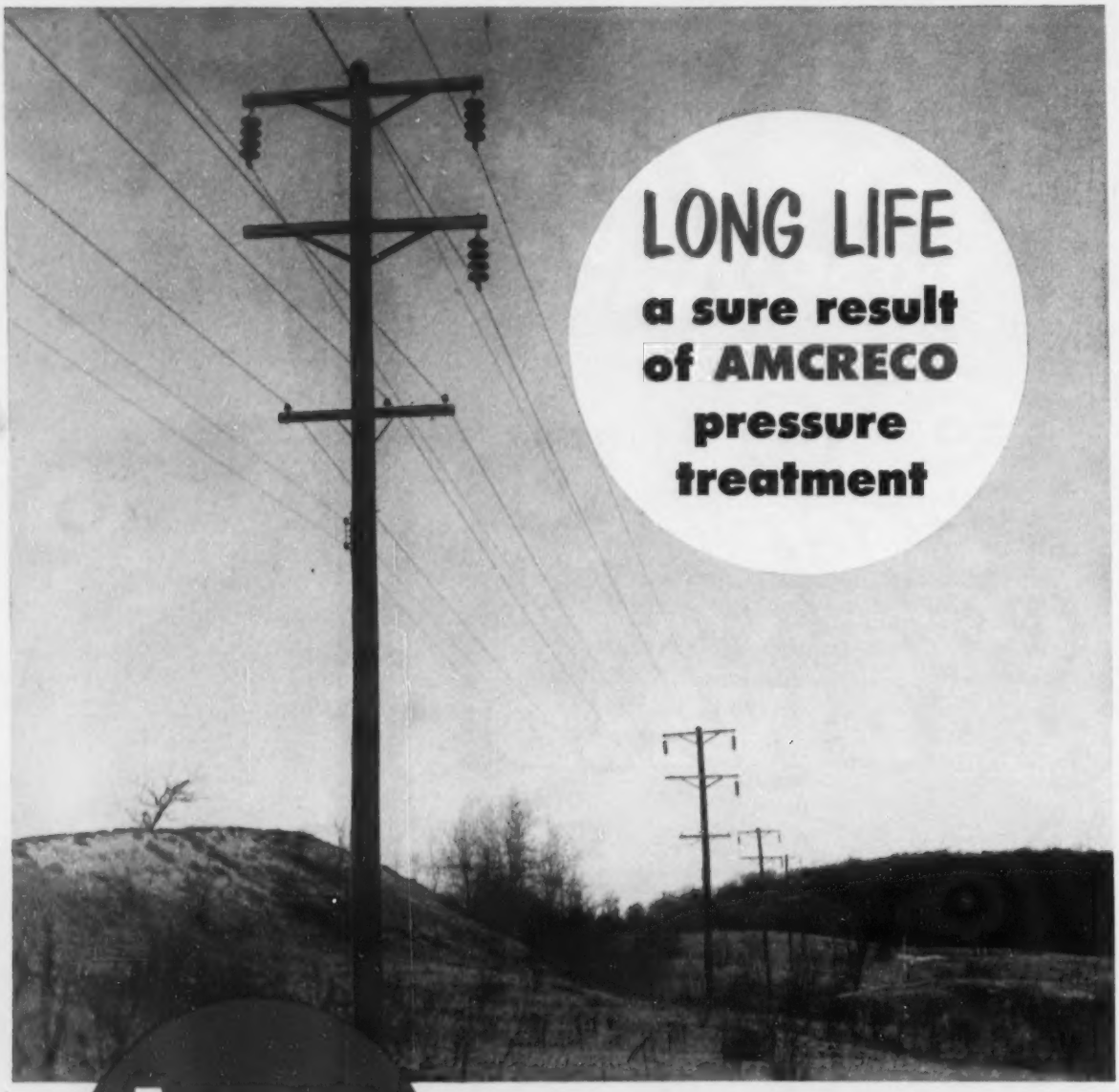
☐ Have Representative Call

NAME _____ POSITION _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____



LONG LIFE

a sure result of AMCRECO pressure treatment

Amcreco
Lowry Process
Creosoted Products

POLES
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You can reduce maintenance costs and build extra years of service into your lines by installing Amcreco pressure treated poles. Amcreco pressure treatment with creosote oil preserves the natural strength of the wood—armors the pole against insects and fungi—assures greater strength and dependability throughout the life of the pole.

Our nearly fifty years of experience in creosote treatment and our strategically located facilities are at your service. Let us discuss your next requirements with you.

AMERICAN CREOSOTING COMPANY

COLONIAL CREOSOTING COMPANY INCORPORATED

AMCRECO LOWRY PROCESS CREOSOTED PRODUCTS

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GENERAL SALES OFFICE—CHICAGO, ILLINOIS
18 FIELD SALES OFFICES TO SERVE YOU

TODAY'S BIG IDEA

IN HIGH VOLTAGE APPARATUS BUSHINGS

IS SMALLER, LIGHTER...

it's LOCKE'S type U

For 92 KV and above. Type U gives you all the desirable electrical characteristics of earlier bushings PLUS the added advantages of smaller dimensions and lighter weight.

For example, Locke's 161 KV Type U bushing is 6¼" smaller in ground sleeve diameter, and 590 lbs. lighter than its equivalent of earlier design.

This means transformers and oil circuit breakers can now be built lighter and smaller . . . something you've always wanted.

Locke Type U bushings are ideal for replacement purposes because they are easier to handle during installation . . . require less storage space.

Specify them for your apparatus.

DESIGN ADVANTAGES OF LOCKE'S TYPE U APPARATUS BUSHING

1. LIGHTER WEIGHT and smaller diameter made possible by a special oil-impregnated paper core with imbedded *conducting stress* equalizers. This, together with terminal and ground shielding, provides uniform internal voltage gradients as well as controlled external voltage distribution. The bushing is much smaller in weight and diameter without sacrifice of dielectric strength.

2. PERMANENT HIGH DIELECTRIC strength of paper core assured by positive seals and inert gas pressure against entrance of air and moisture.

For use at 69 KV and below, specify Locke's Type LC Bushing.

3. INITIAL LOW POWER FACTOR of bushing *remains* low in service.

4. CAPACITANCE TAP is standard feature, providing a voltage supply for potential devices and simplifying power-factor testing.

5. CORONA-FREE, Locke Type U has excellent radio-influence voltage characteristics.

6. NO SERVICING REQUIRED other than periodic inspection and cleaning of porcelain surfaces.

LOCKE

LOCKE DEPARTMENT
GENERAL ELECTRIC COMPANY
BALTIMORE, MARYLAND

Don't Let Poor Voltage Cut System Profits!

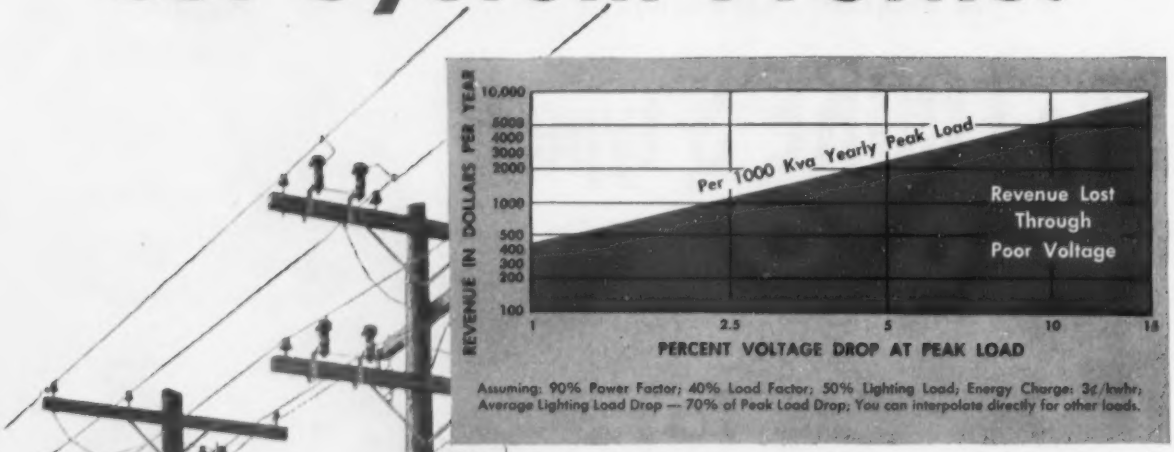
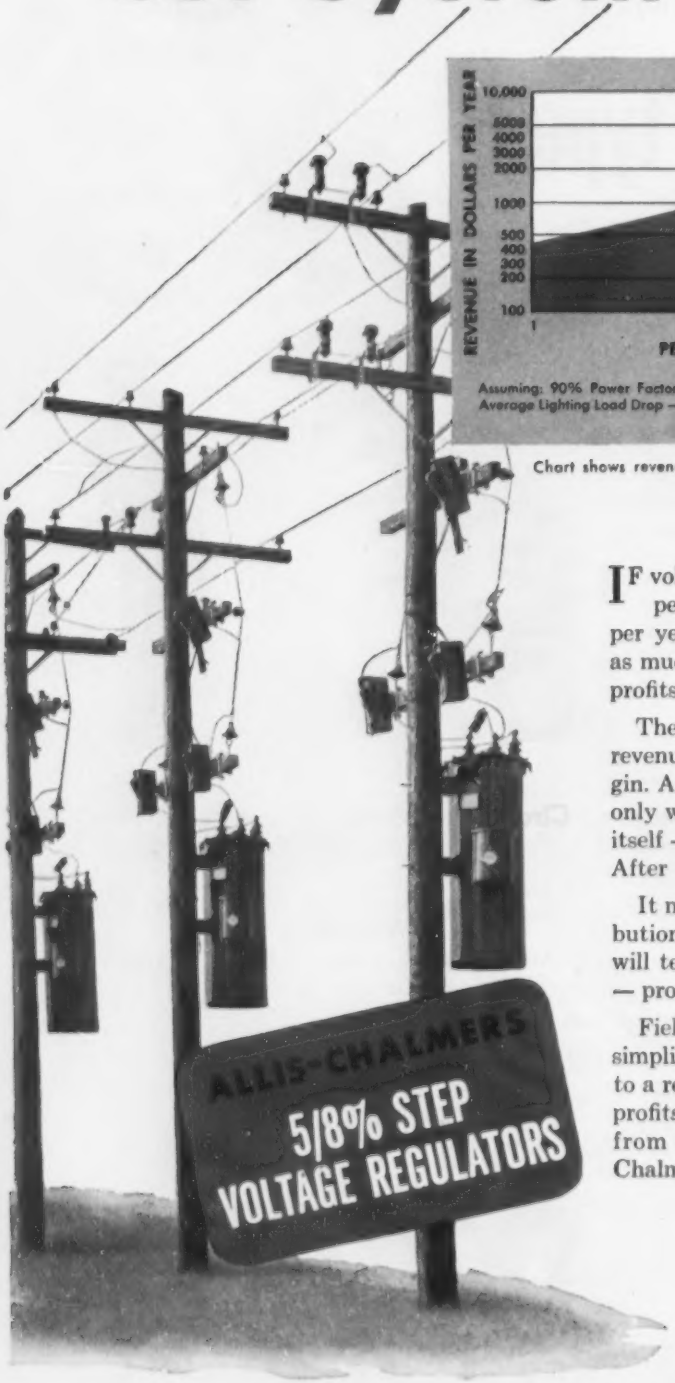


Chart shows revenue losses when voltage is poor on a typical distribution line.



IF voltage is only 2.5% low on a 1000-kva yearly peak load, your system loses as much as $600 per year. Ten percent low voltage means loss of as much as $4500 in revenue. It's a direct loss in profits when your voltage isn't right.

There's an easy-to-install way to get this lost revenue back where it belongs—in the profit margin. An Allis-Chalmers distribution regulator not only will provide accurate voltage, it will pay for itself — in less than two years in many instances. After that, all revenue increases are pure profit.

It makes sense to choose Allis-Chalmers distribution regulators. Hundreds of distribution men will tell you about their accuracy and reliability — proved in twenty years of operation.

Field-proved design, rugged construction and simplified installation and maintenance add up to a regulator that can turn lost revenue into real profits for your system. Get more information from your nearby A-C office or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-4416

ALLIS-CHALMERS

Announcing New, Re-Designed

Arktite

HEAVY DUTY

PLUGS & RECEPTACLES

NEW pressure connectors; no soldering unless you prefer to do it.

NEW easier-to-wire interior assembly; comes out in one piece—just remove 2 screws.

NEW easier-to-interchange plug and receptacle interiors; no machining; no special tools.

NEW plug adaptability; takes any size portable cable up to full 30 amp. capacity.

Circuit-Breaking Features Make Arktite Safe at Full Load Without Disconnect Switches

Each contact is insulated in a separate chamber. Arcs formed while making or breaking circuit are snuffed out in arcing chambers by pressure-deionization and lack of oxygen. No chance of flash-over even if break is made at full load. With grounding contacts longer than load contacts, plug and tool are grounded *before* circuit is made and *after* it is broken.

New *Arktites* now available in 30 amp. size — 2-pole, 3-pole and 4-pole styles. Fully interchangeable with old *Arktites* — *same economical price.*

SEND FOR FREE BULLETIN

OR SEE YOUR CROUSE-HINDS DISTRIBUTOR.

A NATIONWIDE DISTRIBUTION exclusively through ELECTRICAL DISTRIBUTORS

CONDULETS • FLOODLIGHTS • TRAFFIC SIGNALS • AIRPORT LIGHTING

DISTRIBUTION TRANSFORMERS
different from others because.....
NOW
STAINLESS
STEEL

...Stainless Steel Clamping Bands

prevent rust and corrosion . . . easy to put on and take off

One-piece cover bands on cover, handhole cover, and bushings of General Electric distribution transformers are easy to remove for inspection or maintenance—and are just as easy to replace. Only a screwdriver is needed to loosen or tighten the one bolt which holds each band in place.

Exerting even pressure on nitrile gaskets, the clamping bands assure an airtight seal. This prevents oil contamination even after years of service and results in longer transformer life.

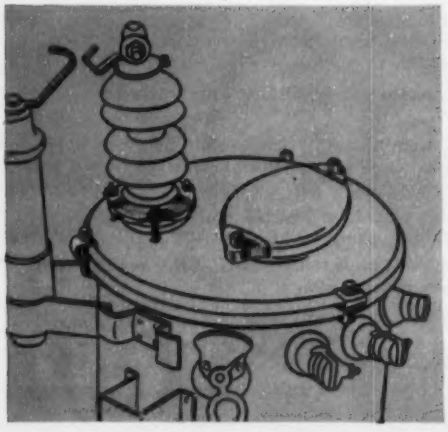
CORROSION IS GREATLY REDUCED by this new G-E design which eliminates bolt clamps and welded projections which can trap moisture and thus cause corrosion. In addition, all G-E bands and bolts (plus Belleville washers on the cover and low-voltage terminal clamps) are made of *stainless steel* to prevent corrosion. (The bands, however, are painted blue-gray to harmonize with the tank.) A coating of Neoprene rubber is vulcanized to the inside of each band to prevent its scratching the tank or cover and starting the corrosion cycle.

REMEMBER . . . all transformers are not alike . . . compare them all and see for yourself why General Electric is your best transformer buy.

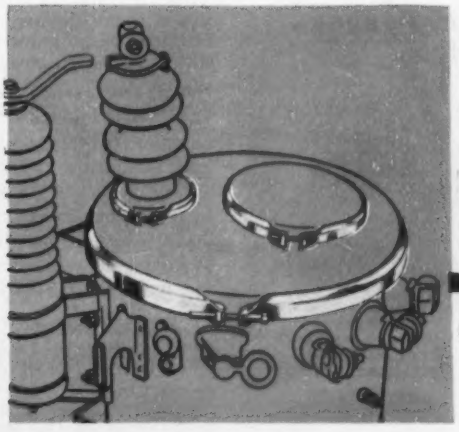
For more information on distribution transformers, either self-protected or conventional, contact your nearest G-E Apparatus sales office or agent, or write to General Electric Company, Section 431-16, Schenectady 5, New York.

Progress Is Our Most Important Product

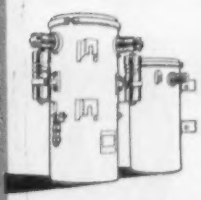
GENERAL ELECTRIC



ORDINARY COVER with bolt-clamps and other projecting surfaces of ordinary carbon steel offers many spots for rust and corrosion to set in.



NEW G-E COVER with its stainless-steel clamping bands has a clean functional design that gives maximum protection against corrosion.



SELF-PROTECTED CONVENTIONAL

"Take your choice G.E. makes both"

THE GREATEST NAME IN ELECTRICAL WIRE AND CABLE

Paper Power Cable

FOR TRANSMISSION

FOR DISTRIBUTION

Productive Pioneering!

Starting with the development of the first Sector Type Conductor (for greater capacity with no increase in cable diameter), General Cable has pioneered many far reaching improvements designed to increase quality, improve efficiency and uniformity.

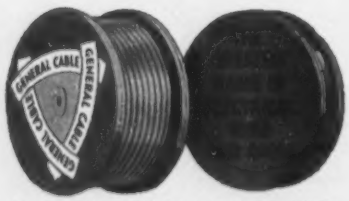
Today, General Cable manufactures the most complete line of Paper Power Cable to meet the needs of power utilities, railroads, large industrial power users, as well as municipal, state and federal governments.

TYPICAL TYPES: solid; low pressure gas or oil-filled; high pressure (pipe type) oil or gas-filled.

CONDUCTORS of copper and aluminum. **COVERINGS:** lead, neoprene over lead, submarine, and other armored types. Special types are also available for operations above 132,000 volts.

It pays to buy in *one* reliable place! Only at General Cable can you find all types of wire and cable for *any* job!

For today as well as tomorrow it pays to *wire BIGGER when building new and wire BIGGER when rewiring too.*



BARE, WEATHERPROOF, INSULATED WIRES and CABLES FOR EVERY ELECTRICAL PURPOSE

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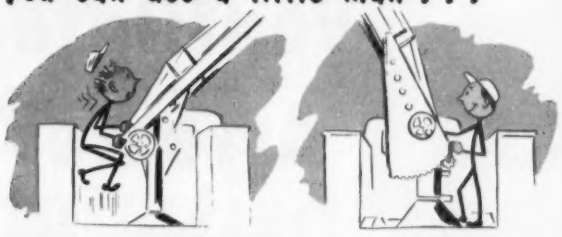
WHY you should buy *the NEW* HOLAN Series 2200 Mechanical Ladder

You can use a little man . . .



Without effort he can elevate the 2200—a heavy man or a strong back is not necessary—just turn a crank.

GEAR & SECTOR ELEVATION

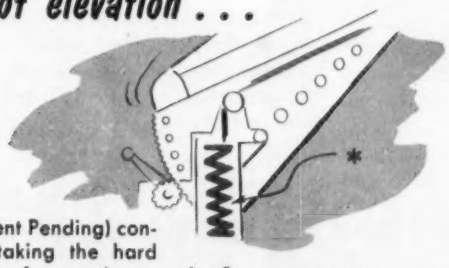
Eliminate Strain & Pain . . .

(on Hill or Crown)

Don't get "pinned" between the ladder and body. Don't strain to turn a heavy ladder on a hill—just turn a crank.

plus **WORM & GEAR TURNING**

Ease of elevation . . .



New (Patent Pending) concept of taking the hard work out of operating a mechanical ladder. A new tension spring and 2½ turns of the crank does the work.

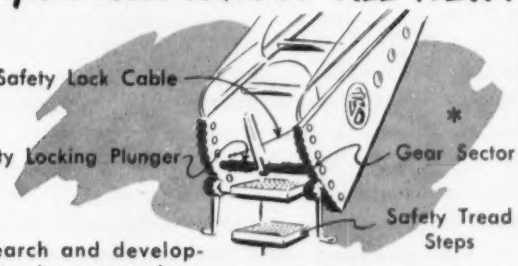
plus **CENTER SPRING COUNTERBALANCING**

Savings justify cost . . .

Greater production through less fatigue using roller bearings—worm and gear—only ladder today that has these two features as standard equipment.

plus **ROLLER BEARINGS**

Compare these features–ALL NEW!



Research and development, plus years of experience give you sound products—more for your money—plus safety.

plus **SAFETY**

This ladder is no afterthought. It is the first all new ladder in many moons . . .

With increased productivity—less time required per job—more jobs completed per day, your savings quickly surpass the cost.

plus **COST EQUALS SAVINGS**

*Another HOLAN "First"

J.H. HOLAN CORPORATION

District Sales Representatives
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Hydraulic Barricks • Jacks
Ladders • Towers • Diggers
and Accessories for
Truck Bodies

Here's a CRYSTAL Ventilated Arrester's lightning

100% Pre-Shipment Testing at Power Frequency imposes higher-than-rated voltage on Crystal Valve Arresters. Illustration shows inspector closing switch for *Surged*-Dynamic Test simulating arrester field operation.

ULTRA-SPEED GAP FOR FASTEST PROTECTION
VENT OPENINGS ELIMINATE CORROSION DUE TO MOISTURE
CRYSTALLITE GIVES MULTI-PATH DISTRIBUTION OF SURGE

It's how they're made that permits you to expect greater protection

You don't gamble when you install CRYSTAL VALVE Ventilated Gap Lightning Arresters on your power lines or transformers. Pre-shipment testing proves every unit is built to effectively operate in service within its name plate rating.

Every assembled CRYSTAL VALVE gets a three-way test. *First,* each is visually inspected for physical or mechanical defects. *Second,* each receives the Surged-Dynamic Test to guarantee its rating under service conditions. *Third,* the Spark-over Tests prove the Crystal Valve Arrester is not unduly sensitive to line voltage variations. Each arrester must conform to strict engineering requirements in all these tests.

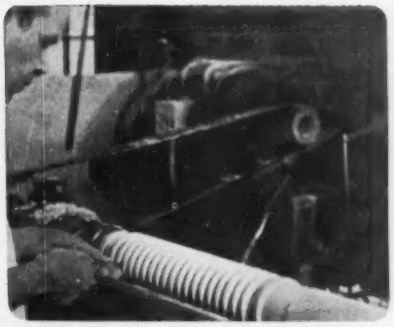
What furnishes this positive protection? Perfect valve action of the packed—not bonded—multi-path valve element. Ultra-speed, spark gap element service-engineered to be the fastest gap in the industry. Engineered gap ventilation that assures freedom from gap corrosion.

Let us show you how better than 99% in-service performance confirms the 100% test performance of CRYSTAL VALVE Ventilated Gap Arresters. Write today for complete engineering installation data.

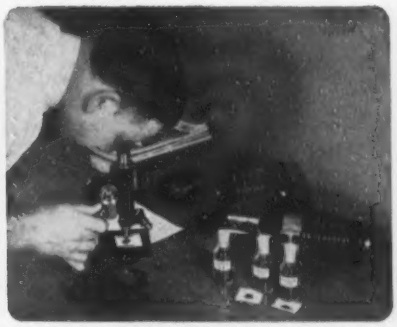
CRYSTAL VALVE
LIGHTNING ARRESTERS

proof of VALVE Gap positive protection

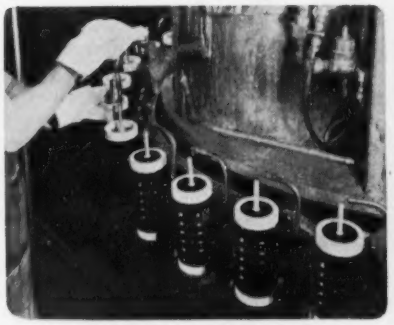
Steps in Making CRYSTAL VALVE ARRESTERS



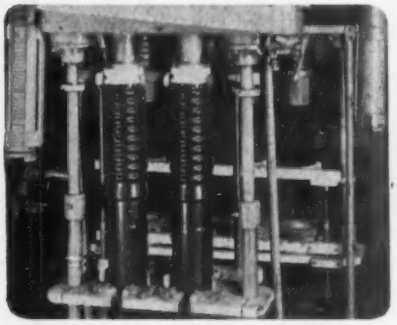
1. High-strength Porcelain Body is formed on lathe before firing in kiln. Wet-process porcelain for electrical use provides dense, sturdy housing of high dielectric and thermal strengths.



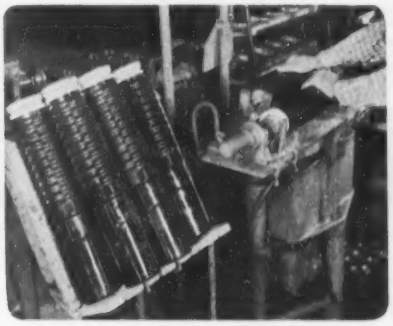
2. Perfect Valve Action is safeguarded. Every batch of Crystallite (oxidized silicon carbide grains) used as valve element is inspected for grit size, porous silicon dioxide coating, and electrical performance.



3. Moisture-proofing Arrester bodies as they revolve, up-ended, on "merry-go-round." Molten compound is poured onto gasketed ground contact plate, around main ground stud member.



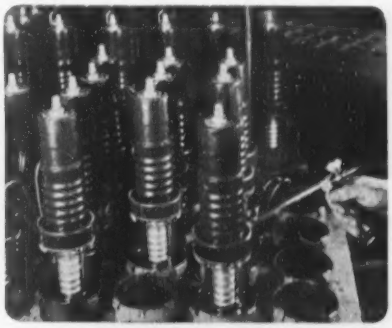
4. Precision Filling Machine automatically measures Crystallite grains into Arrester body. Line contact plate and gasket retainer plate are placed on top of valve element. Grains are uniformly settled.



5. Uniformly Settling Grains of valve element assures uniform surge current distribution. Rocking, rotating and pneumatic packing of grains are followed by hermetically sealing.

6. Ultra-speed Arcing Units are assembled: electrodes, steatite ceramic rod and spacers, terminal "hardware." Spark-gap assembly is inspected, installed in Arrester over retainer.

7. Sure-fit Copper Cap Crimped over Arrester body by hydraulic pressure. (Porcelain-glass Arresters receive glass housing at this point.) Base "hardware" is assembled, fastened.



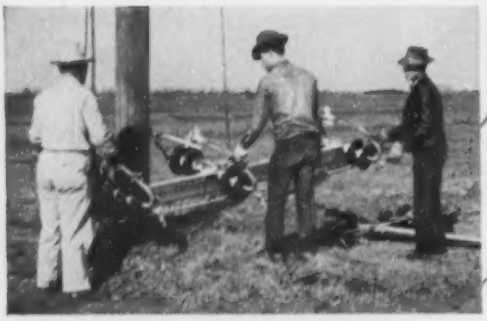
8. Weather-proof Sealing Cap and glass housing. Non-siphoning line lead is attached, porcelain top cap installed. Sealing compound is poured into cap and housing skirt, "torched off."

Electric Service Manufacturing Co.

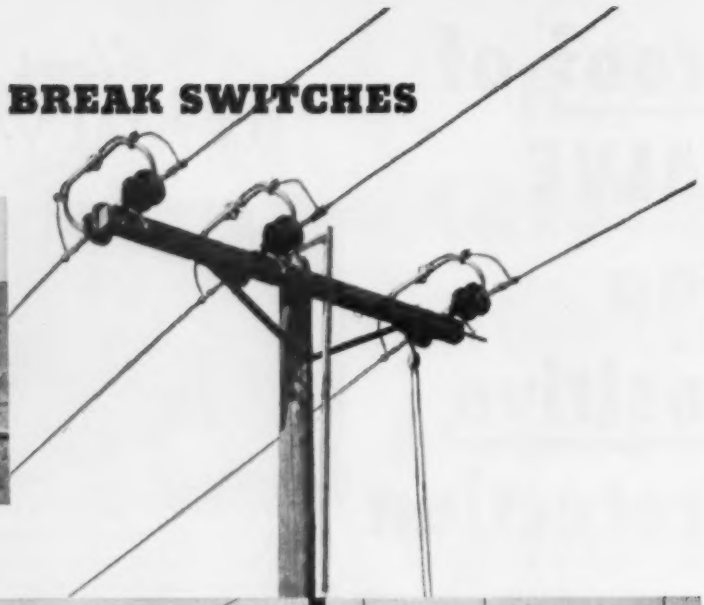
PHILADELPHIA 32, PENNSYLVANIA

Represented in Canada by Lyman Tube and Bearings, Ltd., Montreal and Toronto

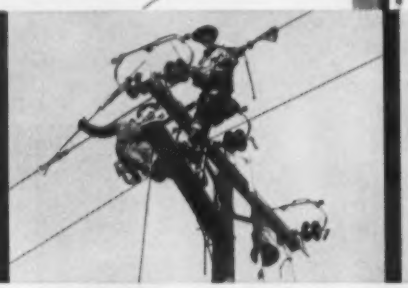
KPF AIR BREAK SWITCHES



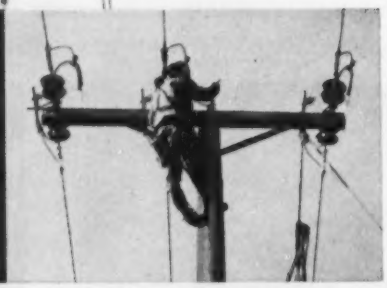
1 Sturdy factory-assembled phase units are bolted to cross-arm and push-pull interphase control rods installed on the ground. (Installation is equally simple in the air on installed cross-arms.)



2 At pole top, linemen receive switch bolted to cross-arm and ready to install on pole. Simple design and use of quality materials means KPF phase units are rugged, yet amazingly light weight.



3 Cross-arm bolted to pole, braces and first section of control rod installed. Linemen connect conductors quickly and easily to any standard strain clamp and dead-end direct to phase units.



4 Conductors connected, crank arm being adjusted on push-pull interphase control rod. Like KPF switches and Quick-Breaks, KPF controls need no lubricating. They crack off any icing, are never affected by cross-arm warpage.

Time-tested KPF switches install simply, easily—in 1/2 normal time

KPF switches—the switches that look different because they *are* different—install differently, too. Experience of leading Western power companies shows that KPF switches are normally installed in ½ the time required for complex, cumbersome ordinary equipment. Each KPF phase unit is light weight, readily handled by one man. No extra cross-arms or special supporting structures are needed. Each phase unit is fully assembled, tested and adjusted at the factory. The unit is ready to operate when it reaches the job—no waste of lineman's time. Dependable KPF switches may be mounted horizontally, vertically or triangularly with equal success and long-term, trouble-free service.

For the world's simplest, surest, lowest cost air break switch, specify KPF—standard for nearly 50 years.

5 Installation complete. Lineman installs operating lever and last section of control rod. Note the neat, clean pole top appearance of KPF switches—a familiar sight throughout the West on such famous systems as PG&E, Southern California Edison and others.

KPF
AIR BREAK SWITCHES
Standard for nearly half a century

New catalog gives complete specifications, detail drawings, installation data.

KPF ELECTRIC COMPANY

2987

1624 East Alpine Avenue, Dept. E, Stockton 5, California

And Now...

RCA Announces the FIRST Low-Cost Packaged Microwave with Voice Channels

PROVED throughout the nation and the world, RCA 960 megacycle Microwave is now available in a low-cost "package" unit, MM-9, as a complete station.

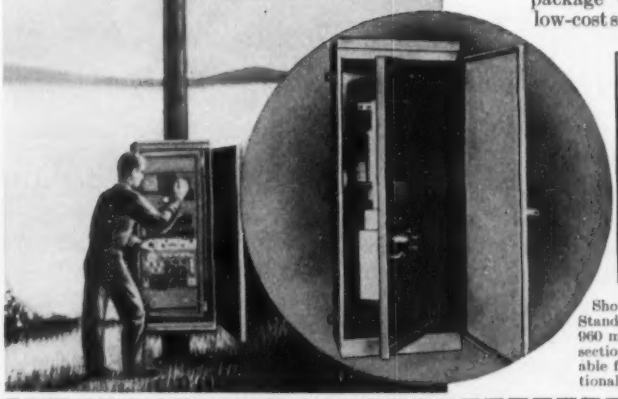
Important savings include:

- **Minimum real estate requirements**
- **No tower construction**
- **Easy economical installation**
- **Minimum maintenance**
- **Unattended reliable operation**

When mounted on inexpensive supports, such as wooden poles, up to 100 feet high, or on existing structures, which can be spaced 20 or more miles apart, the MM-9 Microwave "package" units provide an ideal low-cost solution to many point-to-point communications problems.

RCA Microwave uses highly directional radio signals which are beamed from one relay station to the next by "dish" antennas. It can be interconnected with existing telephone lines and switchboards and virtually eliminates the weather hazards of carrier and wire lines. RCA Microwave employs readily available tubes and familiar circuits which are easy to service. The RCA Service Company provides nationwide installation and service facilities, if desired.

For complete information on the new MM-9 Packaged Microwave Stations, send coupon, below.



Showing hinged rack construction, with all components easily accessible for servicing. Standard "package" equipment includes weather-proof cabinet, 2 parabolic reflectors, 960 megacycle transmitter unit, exciter unit, 960 megacycle receiver. Also 2 100-ft. sections of semi-flexible transmission lines with all required fittings. Space is available for multiplex equipment to provide two voice channels with signaling. Additional multiplex equipment can be mounted in a similar cabinet.

Typical Uses of MM-9 Packaged Microwave:

1. Telephone Circuits
2. Supervisory Control
3. Remote VHF Control
4. Facsimile
5. Teletype

FOR

- Gas Utilities
- Electric Utilities
- Pipelines
- State Agencies
- Municipal Systems
- Police Departments
- Transportation Systems

RCA

RADIO CORPORATION of AMERICA

COMMUNICATIONS EQUIPMENT

CAMDEN, N. J.

Radio Corporation of America, Camden, N. J.
Dept. J-45, Building 15-1
In Canada, RCA VICTOR Company Limited, Montreal
Please send me your new booklet, "RCA Low-Cost Packaged Microwave Stations."

NAME_____ TITLE_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE_____ STATE_____

☐ *Have an RCA representative get in touch with me.*

How NEW DESIGNS

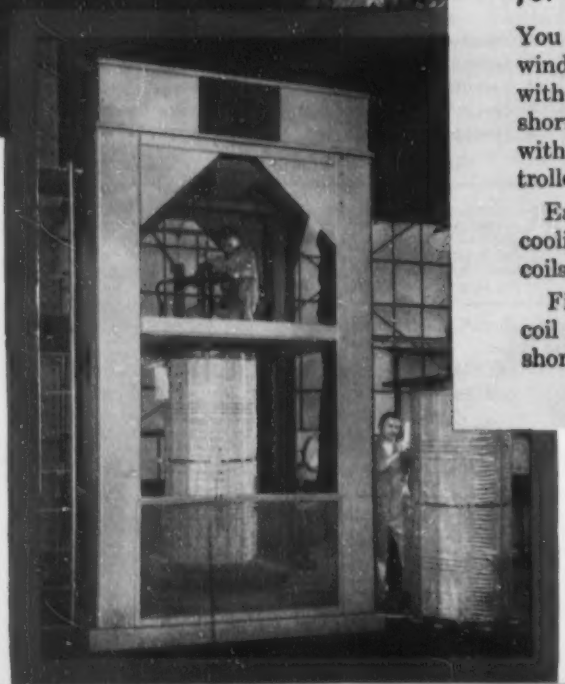
ALLIS-CHALMERS
POWER
Transformers

NEW *No-Splice Continuous Winding for High Voltage Coils*

You get high inherent mechanical strength from continuous winding of high voltage coils that are wound on solid barriers without splicing. They are well-balanced to prevent high short-circuit stresses. Photo above shows how turns are wound with exact degree of tension to make a tight coil. Carefully controlled tension eliminates any possibility of damaging insulation.

Each coil is well ventilated with each conductor exposed to cooling oil. A special snap-lock spacer locks in place between coils to form a uniform cooling duct.

Final step is shown at left. A hydraulic press compresses coil stacks to exact dimensions for further protection against short-circuit stresses.



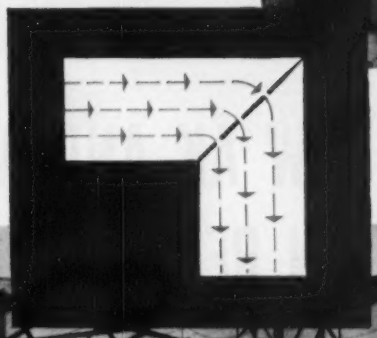
ALLIS-

Improve Power Transformers

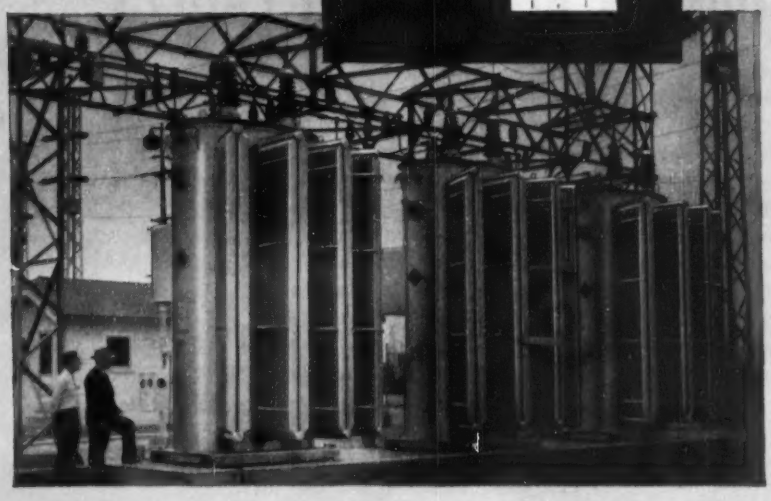
New continuous windings on solid barriers eliminate all splices and assure high mechanical strength of coils on Allis-Chalmers small power transformers . . . snap-lock spacers provide uniform cooling ducts. New mitered core design gets full advantage from modern core steels, reduces exciting current. Here's the full story:

NEW *Mitered Core Design Uses Cold-Rolled Steel*

Transformer exciting current is reduced 50% when mitered core design permits use of best properties of cold-rolled steel. Steel is cut and stacked to take advantage of orientation so that flux flows easily. Mitered core also permits reduction in weights and dimensions.



MITERED DESIGN MINIMIZES AIR GAP between joints, keeps exciting current low. Steel is cut and stacked to take advantage of orientation properties of core steel.



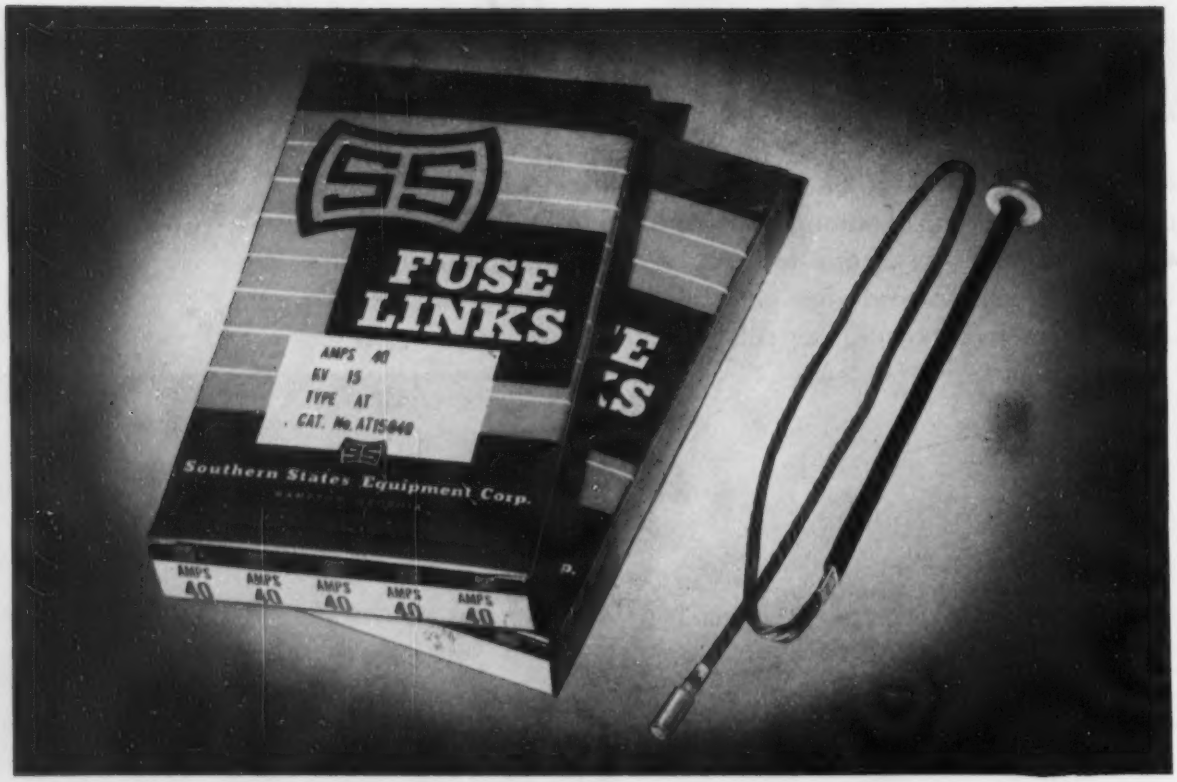
Next time...

you consider power transformers for your system, it will pay to investigate the advanced design and expert workmanship Allis-Chalmers provides. Call a transformer expert from the nearest A-C office or write Allis-Chalmers, Milwaukee 1, Wisconsin for more information.

A-4408

A-C ALLIS-CHALMERS

CHALMERS



SOUTHERN STATES NEW AK AND AT LINKS ASSURE PROTECTION ON RESTRICTED FAULTS

Southern States Types AK and AT Fuse Links, which meet EEI-NEMA standards, employ a principle that provides complete dependability in clearing restricted overloads, as well as high short-circuits.

This new arc-quenching ability at overload currents is a standout feature of these Southern States links. It is accomplished through the use of boric acid powder located in intimate contact with the arc of a rupturing link. The mass of boric acid volatilizes, instantly building a vapor pressure high enough to quench the arc. In addition, the high vapor pressure expels the lower end of the fuse link at a velocity far greater than with a conventional spring.

Southern States AK and AT are universal type fuse links and are easily adapted to fit any double vented cutout from 5 KV through 17 KV. Simply remove the screw on button head, cut the flexible cable, and screw the two threaded ferrules together. The result is a double pigtail link as required in double vented fuse holders.

These new links have such features as silver plating of all external metal parts ... high strength crimped joints ... low melting temperature elements ... moisture-proof auxiliary tubes ... and dual element construction providing low melting temperature coupled with high surge stability. The links are highly resistant to corrosion and more dependable mechanically and electrically than ever before.

It will pay you to specify Southern States AK and AT Fuse Links with their multiple advantages.

SOUTHERN STATES EQUIPMENT CORP.
HAMPTON, GEORGIA

"We have used D-H MANGANIN for 25 years..."

DOUBLE-PURPOSE BRIDGE. This Shallcross Model 6320 Wheatstone Limit Bridge can be used both for exact resistance readings and, in production, for rapid checks on percent deviation from an accepted standard. Overall range extends from 0.1 ohms to 111,110,000 ohms. All resistors are D-H Manganin.

Says **SHALLCROSS MANUFACTURING COMPANY,** Collingdale, Pa.: "For 25 years we have been using Driver-Harris Manganin wire in the construction of Wheatstone and other precision bridges. In addition, D-H Manganin alloy has been used in many special standards for research and development laboratories. We feel that the quality of our products and the reputation of our instruments have been greatly enhanced by its use."

Behind statements like these stand Driver-Harris production and drawing techniques, which provide Manganin of such fixed stability that maximum change in resistance between 15°C and 35°C is only about 15 parts per million per degree centigrade—and frequently *less than one-third this* amount. Equally good electrical characteristics are available for ammeter shunt stock operating between 40°C and 60°C.

The experience of Shallcross reflects the experience of a host of manufacturers throughout the country; reflects what *you* can expect from Driver-Harris products, whether Manganin or any of the numerous alloys developed by Driver-Harris for application in the electrical and electronic fields.

Whatever your alloy problem, therefore, let us have your specifications. We'll gladly put at your disposal the skills acquired from 50 years of alloy manufacturing experience . . . make recommendations based on your specific needs.

*T. M. Reg. U. S. Pat. Off.

*Sole producers of world-famous Nichrome**

Driver-Harris Company

HARRISON, NEW JERSEY

BRANCHES: Chicago, Detroit, Cleveland, Los Angeles, San Francisco

In Canada: The B. GREENING WIRE COMPANY, Ltd., Hamilton, Ontario.

MAKERS OF THE MOST COMPLETE LINE OF ELECTRIC HEATING, RESISTANCE, AND ELECTRONIC ALLOYS IN THE WORLD

The Kerite insulated cable and wire exhibited at the International Centennial Exposition of 1876, received a certificate of award from the United States Centennial Commission, dated September 27, 1876. It is interesting to note that the telephone and multiple telegraph of Dr. Alexander Graham Bell were also exhibited at this exposition.

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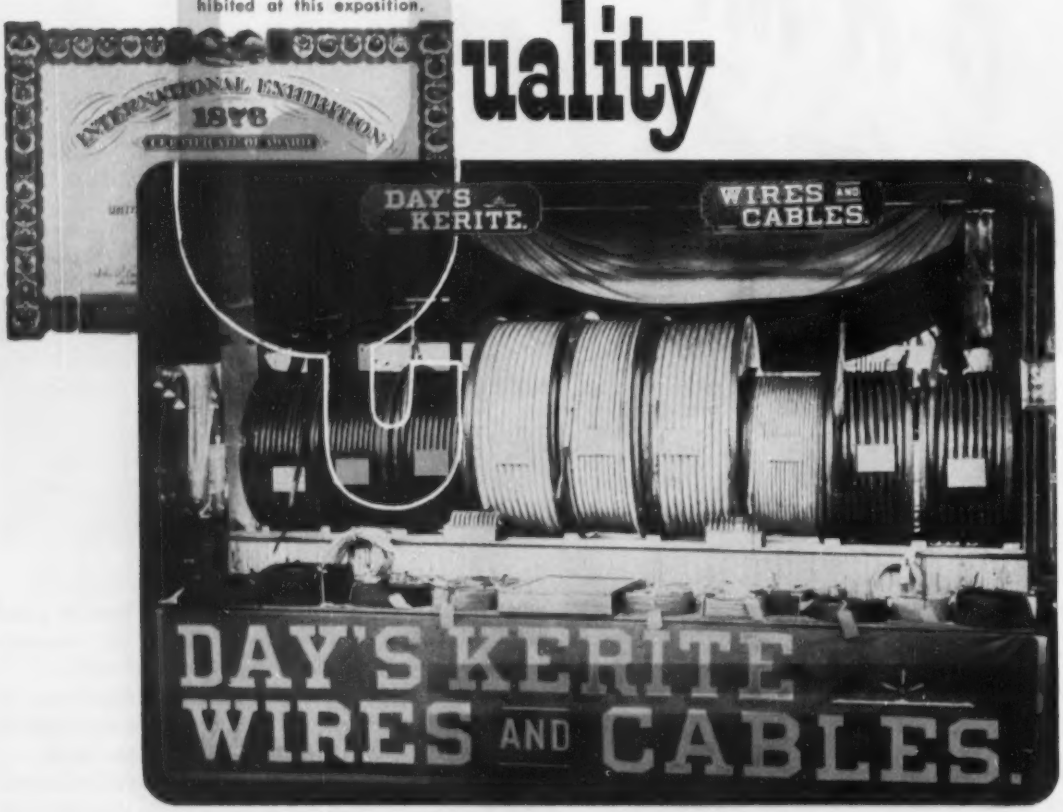


The quality of Kerite insulation had received world-wide recognition as early as 1876 and has been reflected in its enduring performance under the most adverse conditions. There is only one grade of Kerite insulation—the best.

The value and service life of a product can be no greater than the integrity and craftsmanship of its maker.

DAY'S KERITE 100th Anniversary 1854 1954

KERITE CABLE

THE KERITE COMPANY—30 Church St., New York 7, N. Y.
Offices also at 122 S. Michigan Ave., Chicago; 582 Market St., San Francisco; 3901 San Fernando Rd., Glendale 4, Calif.; 31 St. James Ave., Boston

EDITORIALS

The Industry Answers a Challenge

The Dixon-Yates proposal for supplying a large block of power for Atomic Energy Commission use is the industry's answer to President Eisenhower's challenge. In his Jan. 21 budget message to Congress, the President had said he would look to "other sources" to relieve the Tennessee Valley Authority of a commitment to supply some 500,000 to 600,000 kw of power to AEC.

This move was in line with the Administration's clearly stated policy of encouraging local enterprise to meet area power needs and of trimming federal appropriations for electric power generation. It was up to the electric utility industry or to local public bodies to accept the President's call for non-federal help.

Electrical industry leadership came in the proposal envolved by the team of Edgar H. Dixon, president of Middle South Utilities, Inc, and E. A. Yates, chairman of the board of the Southern Co.

It is a firm proposal with the newly-created Mississippi Valley Generating Co assuming a large share of the risk of keeping costs within contract estimates and absorbing the plant output in case the government decides to cancel the contract.

Cost of the 650,000-kw plant and related transmission facilities which the new firm proposes to build near West Memphis, Ark., is estimated at $107 million. If actual project costs should rise to as much as $120 million, the return on the $5.5-million equity investment will be zero. Should the installation cost run below the $107 million estimate, AEC will benefit equally with the new company from the resulting lower charges.

Another element of risk in this proposal comes in the cancellation clause which the government alone may invoke. Upon completion of the project, the contract may be cancelled by the government on three-years notice, and Mississippi Valley Generating is obligated to absorb the entire output of the plant into other systems within a five-year period after the cancellation becomes effective, or sooner if possible.

These two features alone take this proposal out of the "cost plus" category where its critics have sought to place it. There appears to be considerably more private risk involved in the Dixon-Yates proposal than in any other contract of this scope that AEC has ever negotiated.

The expected return of 3¾% on the total investment will barely cover the cost of furnishing the funds, all of which will be obtained from private sources. This compares with an average return of about 6% earned by regulated electric utilities.

But politicians have seized on the Dixon-Yates proposal as a means of attacking the Administration's power policy. With questionable figures and large doses of name-calling, they have attempted to discredit the proposal and the Administration. Democratic National Chairman Stephen A. Mitchell has even gone so far as to impugn the motives of President Eisenhower. By this means some politicians have been successful in distorting this proposal and creating a false picture in the minds of the public.

Yet when the full government documents on the negotiations were released, no critic, political or otherwise, was able to point to a single example of wrong-doing or act of bad faith.

As it now stands, the Dixon-Yates proposal is free enterprise's answer to further expansion of federal power generation. It is a sound answer made by honest men with little to gain in the way of financial reward.

Steam Purity for Super Pressures

Steam at 3,206 psi and 705 F is under critical conditions. There is no latent heat absorption for the conversion from water to steam. Both water and steam weigh about 20 lb per cu ft. Any effort to separate water from steam on the basis of density differential is futile because there is no density differential. Whatever impurity there may be in the water is almost certain to be present in the steam. Chance for blowdown to discharge the impurities is lacking since whatever goes into the water with the feed to a once-through boiler must pretty much come out with the steam.

Unless water purification is carried to new levels of refinement the steam generator, steam turbine, and condenser may thus be subjected to deposits not experienced with a conventional (ie non-critical) plant. Tubes must be protected from the overheating that could result from such deposits. Some deposits may form at certain stages of the turbines. Others may carry over into the condenser—steam-side of tubes then would have to be cleaned rather than merely the water side. Even if the steam is clean when it reaches the condenser, otherwise inconsequential leaks in the condenser could contaminate the water and up the duty on the purification apparatus.

The once-through boiler that goes with the above-critical steam cycle is basically different from the familiar recirculation boiler. Those who are committing themselves to super-pressures know this, and those who are standing on the sidelines will be watching and wanting to learn. One thing they can be certain enough about at this stage is that water purification will have to transcend what has been typically sufficient practice for sub-critical thermodynamic cycles.

House Heating—What Is and Isn't So

You can know too long too much that isn't so, and you will probably suffer for it. And for your own good you can't know too soon too much that is so.

How much do electric utility managements now know about electric house heating that isn't so? How much do they know that is so?

These are questions for which there is not adequate information to answer conclusively. There has not yet been accumulated a sufficient body of record data on the characteristics of the load to allow separation of what isn't so from what is so.

The load has little or no diversity. It all comes on at once. Is that so—or isn't it?

Demand is directly proportional to temperature drop. Is that so—or isn't it?

The thermal flywheel effect in the heated structure cannot be used as a factor in control of the heating demand. Is that so—or isn't it?

There are psychological and physiological factors in the radiant effect of electric heating that reduce the BTU requirement from that of combustion heating. Is that so—or isn't it?

Distribution transformers can safely carry 50% to 75% more of winter heating load than they can of summer air conditioning load. Is that so—or isn't it?

To these statements and others about the electric house heating load come reactions of " 'tis so" and " 'tain't so", depending on who is speaking. And that is not good. It is not good when one considers that with the push of a growing number of manufacturers of heating equipment diligently selling their products, the house heating load can grow much faster than some people think.

It is significant that NEMA organized a new section, composed of makers of house heating equipment, a few months ago. Product competition is keen among the members of the section, but there is one thing they can agree on. This is the need for comprehensive, authoritative data on house heating as a factor in electric service. For their own good, the electric utilities should take the lead in collecting these data.

Another heating season will soon be upon us. Instead of the inconclusive load tests of the past, this coming winter should see many investigations of house heating performance, co-ordinated on common bases so that record figures are comparable. It is high time that the industry set to work separating what is so from what isn't so in electric comfort heating.

Why Do People Act That Way?

There was a utility president who firmly believed that his company had nothing to worry about, nothing even to think about, in respect to public relations. Within a year of his so expressing himself, a strong threat of municipal takeover suddenly arose in his city. There may or may not have been a connection between this and the fact that the utility president committed suicide shortly thereafter.

The foregoing is a true story. It came to mind with the reading of the three-part series on human motivations recently published in Business Week, another McGraw-Hill publication. It was not that the reader was set to wondering why the suicide but to thinking about how a utility president could so solidly convince himself of something that very soon was proved to be wide of the fact. If he had known more about the behavior characteristics of people in the mass, he would probably not have been so sure and maybe would not have been driven to the final, fatal step.

An outstanding impression remains after reading the Business Week series. It is that one cannot be certain, either by "hunch" or by investigation today, of how people will behave tomorrow. New, or existing but unapparent, motivations may cause actions entirely unanticipated. No amount of investigation and analysis will furnish bases for perfectly accurate prediction of what people will do because such prediction requires that a given set of circumstances be assumed and there can be no assurance that the assumption is correct and complete. However, new techniques of searching people's minds in survey interviews, thus disclosing the springs of their behavior, that have been developed in recent years do hold out considerable hope that some day human behavior can be foreseen more clearly than is possible now.

In the meantime it behooves utility presidents never to feel secure in the belief that their companies enjoy the finest of relations with the people they serve and employ. Instead, they should be forever at it to be continuously informed on what customers and employees are thinking and feeling about the company, thus to be in position to react effectively in any situation that may arise.

THE ELECTRICAL WEEK

The Issue's News Highlights . . . Eisenhower went to bat for his partnership power policy in a speech delivered at dedication of McNary Dam. Ike scored federal power advocates as "zealots" seeking a federal monopoly of power.

Oregon's Senator Morse, in turn, accused the Administration of scuttling the public power program.

Signing of Dixon-Yates power supply contract seems assured, in opinion of government experts.

National Planning Association will conduct a two-year study on economics of peacetime atomic energy.

New Atomic Energy Act is a legal headache with few equals. This was impression left by two-day meeting of Atomic Industrial Forum, Inc, at New York, at which two dozen government and industry experts spoke. Panels covered interpretation of the law, industry's outlook on what it may accomplish, government implementation of the statute, insurance problems of the atomic industry, and labor outlook. Almost 500 top and second-echelon businessmen and federal officials participated. Lawrence Hafstad, chief of AEC's Reactor Division, warned that American firms will lose out in the world reactor market if private production is not expedited.

An automatic aluminum rod rolling mill will be in operation in 1955 at the new Great Falls, Mont., plant of Anaconda Wire & Cable.

Inter-Industry Farm Electric Utilization Council's first regional meeting at St. Paul saw the formation of three new state organizations (Iowa, North Dakota, Wisconsin) and the broadening of three others (Minnesota, Illinois, South Dakota) to step up on-farm use. Other meetings will be held at Denver, Columbus, Fort Worth, and Nashville.

Coos-Curry Electric Cooperative has applied for a preliminary FPC permit to build a 140,000-kw power project on the Illinois River in southwest Oregon.

Mechanical failure within the generator caused breakdown of the 150,000-kw Unit No. 1 at Cromby Station of Philadelphia Electric Co at 12:03 a.m. Sept. 27 while the machine was undergoing routine test. It was brought under control without accident to personnel, but considerable damage was suffered by the generating equipment. No interruptions to service resulted nor will shutdown for repair limit ability to meet demands, a company official said.

Washington Water Power is negotiating for surplus power from Waneta Plant of Consolidated Mining & Smelting Co of Canada near Trail, B. C. A 100-mile, 230-kv line would be built to link plant to Spokane. Tie would add 125,000 kw to Northwest Power Pool.

Off the Washington Wire . . . J. D. Stietenroth, secretary-treasurer of Mississippi P&L, who lost his job blasting company policies and "charging it is controlled by Wall Street," testified last week at hearings suddenly called by Sen William Langer's anti-monopoly subcommittee. Langer, a foe of the Dixon-Yates-AEC power contract, has been hunting for ammunition. Stietenroth added nothing to story in EW, Sept. 27, p 7.

Bureau of Reclamation has signed up, or is in final stages of negotiation with, about two-thirds of its customers for western Missouri basin power. How much power has been contracted for was not revealed, but preference customers are taking all of it.

Former FPC Commissioner Dale E. Doty and Norman E. Duke, ex-attorney on FPC's legal staff, have joined the Washington-Tulsa law firm of Doerner, Rinehart, Stuart & Clammer.

Duke Power will build a $24-million steam plant on the Catawba River near Belmont, N. C. First unit will be 165,000 kw, ultimate capacity 1 million kw. Plant will be named for board chairman, G. G. Allen.

EEI Industrial Relations Round Table Conference— To meet and beat our competition we must find ways to increase production. One way to do this is to reduce the waste of human energy, the difference between what employees can do and what they will do, J. P. Flemming, Cleveland Electric Illuminating.

An average of almost $400 a year per employee has been spent by 135 electric and gas companies for retirement purposes, T. G. Ayers, Commonwealth Edison, Chicago.

Industrial relations departments should take the leadership in knitting a close human relationship that has been lost between companies growing bigger and bigger, J. S. Gracy, Florida Power.

Difficulty in the field of employee-employer relations may stem from deficiencies of leadership in routine phases of the work and lack of cooperation and understanding between lower and higher echelons, R. C. Simpson, Gilbert Associates.

Executive Changes . . . Rocky Mountain Electrical League elected as its new president W. L. Breslin, of Western Public Service, effective Jan. 1 . . . Arizona Public Service appointed as vice presidents: Don Willis, sales; Walter T. Lucking, operations; T. A. Phillips, engineering . . . Potomac Edison's new vice presidents are Eugene Gordon, power generation; Henry H. Startzman, operations; and S. Sydney Bradford, commercial operations . . . George R. Woehler, secretary, Southern Indiana G&E, succeeded Charles E. Oswald, retired, as vice president and comptroller.

A New Title for a Page with a Greater Scope

The title above, "Readers Forum," replaces the one that for so many years read, "Letters to the Editor." Behind this change is the editorial philosophy of Electrical World. This page is more than a public repository of letters from our readers. It is an opportunity for our readers to meet with each other and to bring to the industry their ideas and thinking on subjects of concern to all of us.

Of a necessity magazines must be published in an orderly fashion. There is a place for editorials, a place for news, a place for engineering articles, a place for short practical "hows," and a place for the many other departments and services which this magazine provides. From this editorial material which feeds the thinking of the industry come divergent, concurring, and supplementary ideas and opinions. It is only logical that there should be a place for them also in the book that fostered them. "Readers Forum" is that place.

But the editor will continue to welcome letters from readers on subjects of less significance. The forum will carry letters pointing out our errors (May they be few), praising editorials and articles, and seeking information. As always our editorial policy will be to serve each and every one of our readers to the greatest extent possible.

Joint Action Will End the Home Wiring Mess

The Adequate Wiring Bureau of the industry operated for the last year with an appropriation of a little over ⅛¢ per inadequately wired home. Yet each wired home in need of adequate wiring represents a market for over $60 worth of electricity per year. This is nearly twice as much as the user paid 20 years ago, but the consumer gets nearly five times as many kilowatt-hours for his dollar. However, power sales cannot keep going up and power prices keep coming down unless the consumer keeps adding power-consuming appliances.

Sale of appliances is directly affected by the obsolescence of wiring in over three-quarters of American homes. Each wired home represents a potential market for at least $100 worth of appliances per year at manufacturers' prices. This year alone millions of dollars will be lost because of inadequate wiring in homes. And lost sales mean less profit for the utilities as well as the appliance manufacturers, distributors, and dealers.

No Wiring for Desired Appliances

Home wiring is in a mess, and it is getting worse every year. One utility serving over 850,000 one and two-family dwellings surveyed 6,539 of them and found that 78% were inadequately wired for appliances already in use. Over 40% of the home occupants wanted additional appliances, but only 12% had wiring in their homes adequate to permit the use of the wanted appliances.

In the last five months, I have talked with many utility executives, sales and advertising heads of appliance manufacturers, dealers and distributors, and the executive heads of trade associations. All agreed that something should be done. What little that is being done is too scattered and meager to do much to relieve the overall problem.

If the utilities operate on the basis that their job is to serve, then they must take a broad overall viewpoint that they have a major share in the responsibility of seeing to it that their customers get the maximum value from the electric current they buy. At present most of them are not because of inadequate wiring. Some blame the utility, others the appliance manufacturers, or even the dealer. But certainly there is a joint responsibility.

Get the Facts by Local Test

Only by carefully conducted local tests can there be found the facts that will justify the entire industry joining in a national promotion to correct the inadequate wiring mess. For these tests:

- Various size cities should be selected, and assurance should be had that the local utility will cooperate.
- Methods of inducing the owners of inadequately wired homes to act should be studied. Electrical contractors must be found who will do rewiring reasonably.
- Financing must be simple and easy on the buyer.

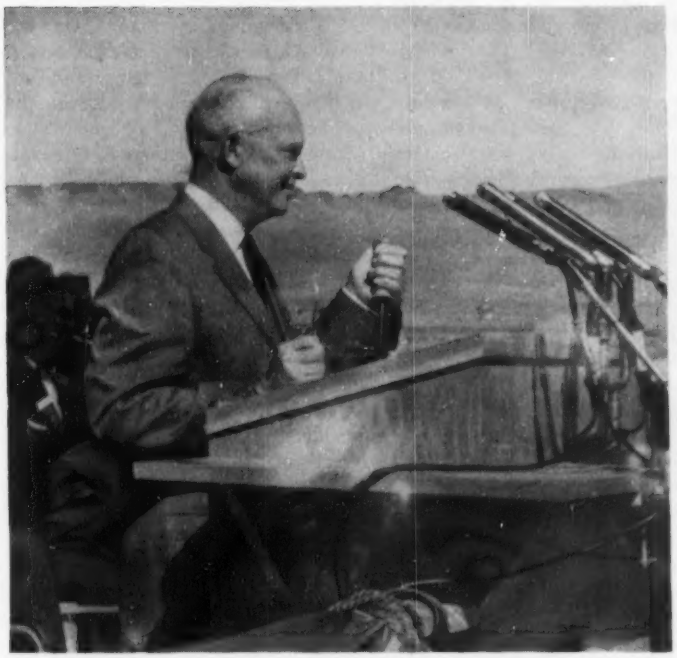
When the cities have been selected, based on the initial contacts with utilities, the cost of the test would be estimated and submitted by the committee for approval. (The committee should be small with authority to make decisions and recommendations on the operations of these test campaigns.) A request should then be made for the funds required to conduct the test campaigns.

All segments of the industry will of necessity have to work together. The appliance manufacturers and the suppliers of materials for wiring should take unto themselves the job of financing the national advertising and public relations work. Money for spending at the local level should be had from utilities, distributors, dealers, and local contractors. The national and local efforts must be planned in such a way that they each will help the other.

John B. Bissell
655 Madison Avenue
New York, N. Y.

(*Continued on page* 160)

President Officiates at dedication



of McNary Dam

IKE REAFFIRMS PARTNERSHIP POLICY

When President Eisenhower officially dedicated McNary Dam on the Columbia River Sept. 23, he reaffirmed his administration's power policy and criticized "zealots" for promoting a "malignant growth of bureaucracy" that he said converts local regions into federal "satellites."

The President also called upon the people to return to self-reliance with the federal government as "partner" in their efforts.

Starts Fifth Unit . . . At the dedication ceremonies, Eisenhower pushed a button to start the fifth 70,000-kw generator at the $286-million dam, which is named for the late Sen Charles L. McNary, Oregon Republican. The multipurpose project, which is 292 miles inland from the Pacific Ocean, was authorized by Congress in March, 1945, and work started two years later. Last of the dam's 14 generators, each with a rated capacity of 70,000 kw, will go into operation in December, 1956.

Among those on the platform on the Oregon side of the dam were Interior Secretary Douglas McKay, Army Secretary Robert T. Stevens, Gov Paul L. Patterson of Oregon, Gov Arthur B. Langlie of Washington, Sen Guy Cordon (R-Ore.), and Maj Gen Samuel D. Sturgis, chief of the Army Corps of Engineers.

The President, who addressed a crowd of 30,000 persons, defended his policies in the heart of a region where public-vs-private power debates loom as a critical factor in November balloting.

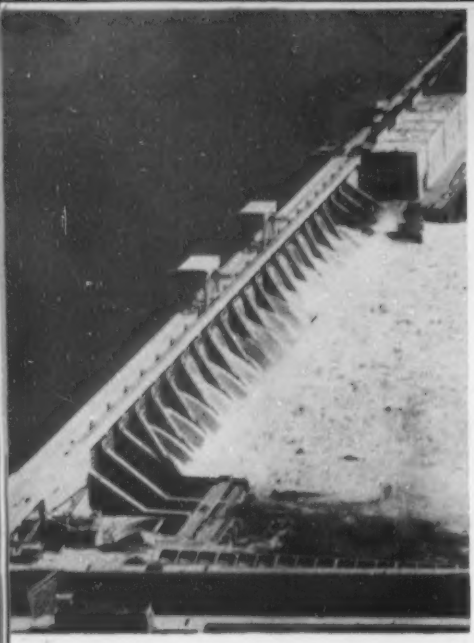
In his opening remarks, Eisenhower paid tribute to the work of descendants of pioneer immigrants to the region, namely McNary and McKay. He also lauded Senator Cordon for his work in Congress.

Although Eisenhower said he was mindful of efforts of Congressmen from this Northwest region, he said the dam means much more than the genius and effort that went into it.

He said, "This structure symbolizes the purpose of using, for the benefit of all our people, the tremendous natural legacy with which the Almighty so abundantly endowed our land."

The wise control of our water resources, the chief executive continued, obviously requires the most skillful and comprehensive planning. He said: "McNary Dam is, therefore, representative of the co-ordination of effort which must mark the development of all of our river systems. It is, moreover, an example of national responsibility properly assumed by the federal government."

Libby Dam . . . Eisenhower continued: "I hope that we shall soon have



McNary: 5 Units on Line

another example of federal responsibility in the generation of power. I refer to the Libby Dam, which—like this great McNary Dam—is a project requiring the resources of the federal government."

He added: "I have recently acted to remove obstacles to the construction of the dam. A new site has been selected. A distinguished Northwesterner, Governor Jordan of Idaho, has been named chairman of the International Joint Commission. His intimate knowledge of this area and sound judgment will surely go far to speed fulfillment of our aims.

"I shall continue to recommend federal construction of such beneficial projects. New ones will be started," Eisenhower declared.

In referring to federal responsibility, Eisenhower said: "It is not properly a federal responsibility to try to supply all the power needs of our people. To attempt such a centralization of authority and responsibility always starts a deadly cycle."

Federal 'Satellites' . . . Eisenhower remarked that, "as federal power expands in a region, and I mean federal authority and responsibility, local enterprise becomes increasingly intimidated and discouraged, even though the needs for energy continue to grow." "Such a conversion of local regions into federal satellites poses a threat deadly to our liberties," the President declared.

In scoring advocates of federal power development, Eisenhower said, in some instances, these disciples of centralized responsibility and authority insist that since the federal government should provide all hydroelectric power it should likewise eliminate competition by providing steam-electric power as well.

Backs 'Free Enterprise' . . . He continued: "Only thus, these zealots would have us believe, can we poor citizens be protected against exploitation against what they call the 'predatory' exponents of capitalism—that is, free enterprise."

Eisenhower declared, "The American people do not want and do not need to have any such monopoly, nor do they want a system leading toward it. They know they can have all the power capacity of our streams developed, as needed, without forfeiting the advantages of local responsibility and participation.

He stated: "This issue is not, therefore, public power versus unregulated private power. The issue posed to us is federal monopoly of power, as against public or private regulated power, freely chosen in each instance by the citizens of each area, with the federal government drawn in as a cooperating partner where this seems necessary or desirable."

Lauds Cordon . . . Eisenhower said he was especially happy that the power produced by McNary Dam will contribute to the "finest type of cooperative effort—your own Northwest Power Pool." He said, "This is a splendid partnership—the kind that the Administration will continue to encourage. I might add that this partnership concept has been most ably advanced by your Republican delegation in the Congress, led by Senator Cordon."

Eisenhower defined the Administration's goal this way: To assure each citizen of enough kilowatts, when he wants them, where he wants them, at the lowest competitive cost—with the least likelihood of bureaucratic domination from Washington, D. C.

Efforts to avoid "extremes" in the power policy will be made, the President declared. He said, "Where local enterprise can shoulder the burden, it will be encouraged and supported in doing so. But, where local action cannot or should not fully meet the need, we shall have federal action."

Morse Accuses . . .

. . . Administration of scuttling public power program in attack on Ike's McNary Dam speech

"The present Administration will go down in the economic history of the United States as the administration which attempted to scuttle the public power program," Sen Wayne Morse of Oregon declared at Wenatchee, Wash., when commenting on President Eisenhower's speech at McNary Dam dedication ceremonies.

The program is a "walkout" on the late Sen Charles L. McNary, Oregon Republican, after whom the dam is named, Morse said.

"Ike should read excerpts from the speeches that Senator McNary prepared in the public power fight he conducted with the aid of Sen George Norris of Nebraska," he suggested.

Calls Ike's Plan a 'Sell Out' . . . Morse further described the Eisenhower power program as a "sell out" that cannot be defended and as "a shocking thing." If the Dixon-Yates power contract involving the Tennessee Valley Authority is allowed to stand, "he'll have established a precedent for undercutting the public power program of the Pacific Northwest for it 'shoots to death' the TVA," Morse predicted.

Morse, who does not favor the "partnership" program, charged Eisenhower has "cut us off from new starts" by halting negotiations on Libby Dam and construction of other developments.

Comments on Omissions . . . In addressing a Chelan County Democratic Jefferson-Jackson Day banquet at Wenatchee, Morse challenged Eisenhower to say "when and where" new hydro power dams will be started in the Pacific Northwest. "That's one of the many things" the President failed to mention in his McNary Dam speech," Morse said.

Morse also criticized Eisenhower for his omission of reference to John Day Dam in Oregon.

"That's the project where Senator Cordon of Oregon entered a bill in the Senate to allow private power companies more than 40% of the cost of construction, which would be borne by the taxpayers, with the companies getting the profits," he said.

Dixon-Yates OK Expected

Signing of the controversial power supply contract is considered a mere formality by government experts

The Dixon-Yates power proposal is still very much alive, politically and as a business proposition.

With signing of the controversial contract expected almost any day, public power advocates opposed to the contract are banking on its value as a political weapon in the next two months, rather than on being able to stop it.

Signing a Formality . . . As Electrical World went to press, no word had yet been received that the contract had been signed. However, experts in the government who have been in on negotiations between the Atomic Energy Commission and the Dixon-Yates group from the start, say the contract is in its final form, and signing is—so far as the terms of the contract proper are concerned—a mere formality.

A last ditch attempt was made a week ago to throw a financial monkey-wrench into the works. American Public Power Association and the power boards of the cities of Memphis and Chattanooga petitioned the Securities and Exchange Commission for a hearing on a request of Middle South to sell 475,000 shares of common stock. The public power bodies contended that Middle South's application was not clear as to the purposes to be served with the proceeds from the stock sale.

Middle South, with the Southern Co. is a principal in the Mississippi Valley Generating Co, the firm formed by the Dixon-Yates group to build a 650,000-kw steam plant near West Memphis, Ark., to channel about 600,000 kw of power to Tennessee Valley Authority as a replacement for energy TVA supplies AEC's Paducah, Ky., atomic plant.

APPA and the power boards asked that SEC fully air the Middle South application for signs of violation of the securities laws.

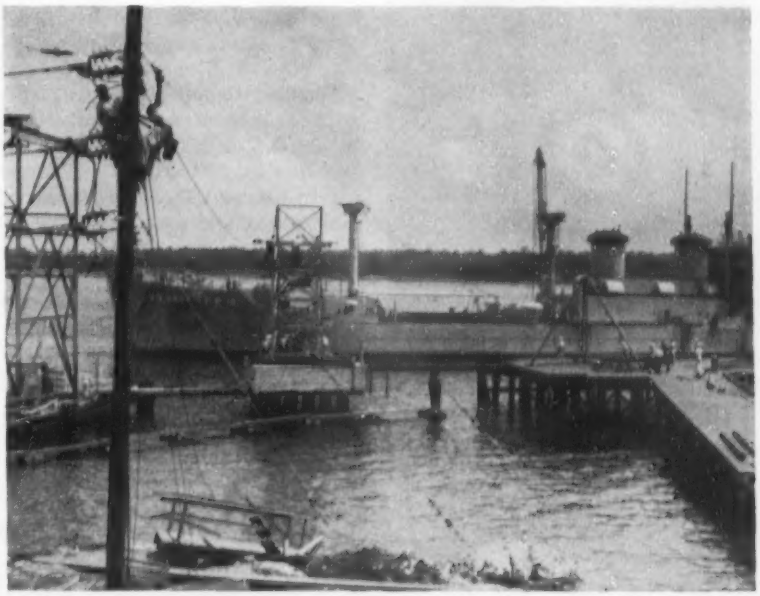
Application Amended . . . Middle South, however, amended its application in a letter to the commission, making it clear it would not attempt to divert any funds from its stock sale to the Dixon-Yates venture unless SEC later approved the transfer in a subsequent proceeding, during which the public power groups would have their day in court.

APPA, Memphis, and Chattanooga withdrew their requests on the basis of this letter, and SEC then announced that a hearing on the stock issue would not be held.

Meanwhile proposed site of the plant at West Memphis has received the approval of Brig Gen John R. Hardin, president of Mississippi River Commission. He said the site poses no problems in flood control or navigation work.

But these are sidelights to the basic issue, and presumably have no bearing on the actual contract signing. The only real hurdle—besides the elections in November, when the Eisenhower Administration stands trial for this and other implementations of its new power policy—is Congressional approval of the contract before it can become effective.

Waiver Will Be Sought . . . No word had come from the Joint Congressional Committee on Atomic Energy last week as to when it would hold a hearing on AEC's expected request for quick approval. Chairman W. Sterling Cole (R-N. Y.), who favors the Dixon-Yates agreement, controls the necessary votes to grant AEC a waiver on the contract. Without a waiver, the contract would have to be submitted for a 30-day study while Congress is in session. It is expected that Cole will let unsatisfied members of TVA fully explain to the public, at this hearing, their objections to implementing the Dixon-Yates contract with a follow-up contract permitting Dixon-Yates power to be wheeled over TVA lines. It is doubted, however, that Cole would permit an argument over the subsequent TVA-AEC contract to hold up signing of the Dixon-Yates-AEC contract.

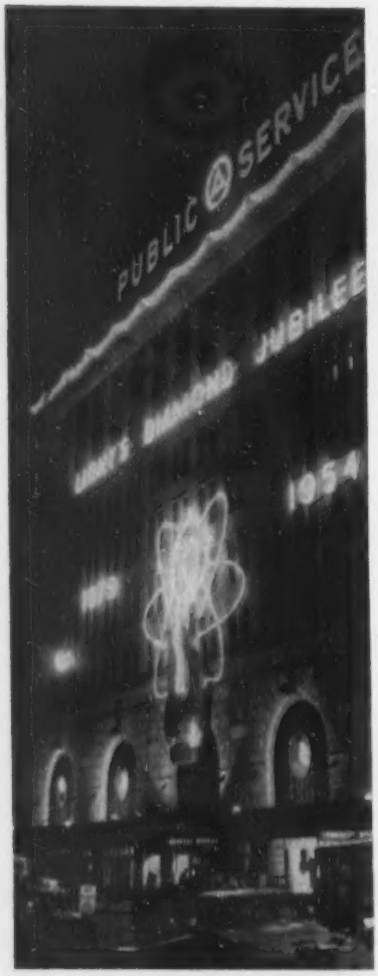


Jacksonville Gets an Assist from the Navy

U. S. Navy's floating power plant, YFP-10 takes on a two-week supply of 600,000 gal of fuel oil at Southside generating station in Jacksonville, Fla. before moving on to its post at Talleyrand Station. The Navy plant, whose three generators have a 34,500-kw capacity, will help alleviate a power shortage in the city caused by failure of a generator at the Talleyrand Station. The municipal system will use the Navy plant for about eight months at a cost of $302,500.

Economics of A-Power to Be Studied

National Planning Association will conduct two-year survey



Public Service E&G Puts LDJ Symbol in Lights

Public Service Electric & Gas Co, Newark, N. J., is making its customers aware of the 75th anniversary of the first successful incandescent lamp by emblazoning the official Light's Diamond Jubilee symbol on the walls of its headquarters building. Smaller displays show the historic bulb and its inventor, Thomas A. Edison. Display was constructed for Public Service by Perdeco Displays.

The National Planning Association's two-year, $200,000 study of the economics of peacetime atomic energy will be devoted primarily to nuclear power.

NPA, financed by a grant from the Ford Foundation's Resources for the Future, Inc, feels exploiting atomic energy for production of electric power promises more in the form of benefits for mankind than any other application of the new science.

Dr Gerhard Colm, economist for NPA; H. Christian Sonne, chairman of NPA's board of trustees; Reuben G. Gustavson, president and executive director of Resources for the Future; and Philip Mullenbach, former Atomic Energy Commission economist who will direct research, discussed the project in Washington. They made it clear that they are out to determine the practical and economic factors involved in absorbing this new source of energy into the modern industrial complex within the next five to 20 years.

Preliminary Report Planned . . . NPA hopes to publish a premilinary report by the end of this year. Mullenbach said they may have quantitative findings by then on U. S. energy resources, as well as an evaluation of the nuclear power contribution. Part of this will be guess work, since NPA does not know now whether such things as fuel cost data will be declassified. However, it will have the benefit of the knowledge of ex-AEC personnel familiar with such matters. But it was also pointed out that no data from the new atomic power reactor at Shippingport, Pa., will be available at that early date.

Cost information from that project won't be ready for three or four years, at least.

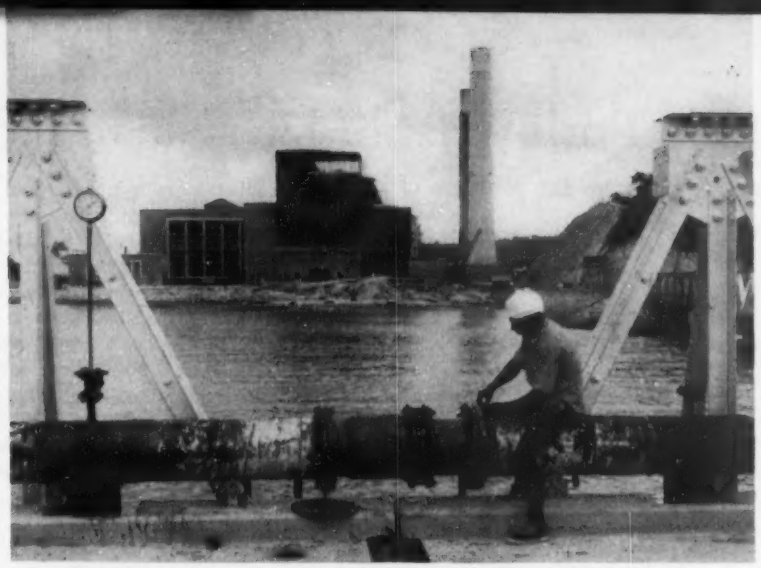
Areas of Study . . . NPA's study will go forward in five areas:

- The national interest. Answers to these questions will be sought: How important is it to get on with the use of nuclear fuels? What is the role of nuclear fuels in relation to conventional sources of energy? How will nuclear power affect further mechanization and automation of industrial processes? How to fit the special problems of nuclear power into general national power policy?
- Interests of U. S. regions. Can the difficulties of regions encountering electric energy supply problems—New England and the Pacific Northwest, for example—be alleviated by development of nuclear power?
- Industry's interest. What are anticipations and needs for atomic energy of such industries as public and private utilities, equipment manufacturers, electro-process power-intensive industries? What are possible patterns of industrial organization?
- Government-business relationships. What are prospective roles in various stages of technical development? (One planner stressed the newness of the atomic government-industry partnership, saying it could set a pattern for other industrial ventures in which the government first plays a monopoly role, then invites private participation.) What are effects of new atomic law, particularly patent provisions and licensing?
- International. What are potential economic effects abroad? What are status and prospects for atomic energy programs in other countries? How can international financing be worked out?

NPA will not have access to classified information during its survey. It does not want to, since it is the feeling at the organization that review by federal authorities is undesirable, and that much effort would be wasted in studying information which could not be turned into a publicly announced recommendation to industry and the public.

Dr Colm said he gained the impression through his initial survey that classification represents a rather serious problem, but that he did not believe it would be a real obstacle to the study.

In a remark indicating the importance of the study to RFF, Dr Gustavson assured NPA of continued financial backing after two years if efforts by then have shown promise, but the job is incomplete.



Singapore's $30-Million Power Project

New power station shown above is being built at Pasir Panjang in Singapore. The 150,000-kw plant, which has been in partial operation for over a year, will cost the Singapore City Council about $30 million. It eventually will include six turbo-generators, each capable of 25,000 kw. Two of these units are now operating. Singapore's 37,000-kw St. James power station, which was opened in 1927, has been interconnected with the new plant and is sharing the load with this new addition. Colony's power consumption is about 200 million kwhr annually.

Reactor Insurance Needs Seen As 'Astronomical'

Huge amounts of insurance protection—more insurance than companies can write—will be required to cover the privately owned nuclear power reactors now under construction or planned.

This was the contention of Claude H. Rice, insurance manager of Babcock & Wilcox Co, in an address made Sept. 15 before a New York Insurance Day meeting.

He said the problem of determining the amount of insurance protection needed to deal with a substance from which harmful radiations are emitted that cannot be detected by unaided senses and which may linger for long periods "staggers the imagination."

Rice cited a recent case where a private firm tried to buy $100 million of public liability insurance.

"Under present circumstances," he said, "it would be lucky if it could get $20 million worth. The insurance industry simply does not have sufficient capacity to write such a policy."

Rice told of some of the hazards that are involved when private industry embarks on the development of atomic energy.

"We must realize that an installation may under some remote, but unhappy, circumstance spring a leak from which a plume of radioactive substances may be ejected into the air and dispersed over the countryside. If the site of operations is close to a populated area, the amount of public liability and property damage liability insurance required may well be astronomical."

He declared that some medium must be set up to relieve industry of these hazards. Because individual insurance companies feel unwilling to write policies in the large amounts needed, he suggested that some federal agency be set up to do the job.

Douglas County PUD Gets Permit for Wells Dam Unit

Federal Power Commission has issued a three-year preliminary permit to Public Utility District No 1 of Douglas County, Wash., for a proposed 588,000-kw hydroelectric project on the Columbia River.

In granting the permit, FPC denied a similar request of the Puget Sound Power & Light Co, of Seattle, on grounds the PUD is entitled to preference. It also knocked out Puget Sound's application to intervene in the PUD's license application.

The PUD's application calls for a concrete dam at the Wells site.

Atomic Plants . . .

. . . will be financed by REA, Ancher Nelsen tells an Elmira, N. Y. co-op audience

Rural Electrification Administrator Ancher Nelsen, touring the country to report on REA's progress to rural electric cooperatives, told an Elmira, N. Y., meeting that his agency will be ready to finance construction of atomic power plants when they can provide a cheap source of power for farms.

Nelsen is making ten appearances before regional meetings of the National Rural Electric Cooperative Association. His talks are in the form of progress reports.

REA Statistical Bulletins . . . Each is based on a statistical bulletin on what REA has done in the last year. Then he adds his thinking on important matters in the areas.

Such was the case at Elmira. In view of high-cost New England area power, Nelsen emphasized to the co-op members that REA will finance such plants under its authority to finance G&T facilities.

But he warned that experimental work in atomic energy is costly, and advised REA's borrowers: "Let somebody else foot that bill if we can be assured of access to what is developed at the time when it actually produces at lower costs." The new atomic law, he felt, assures that.

He told farmers they must prepare for the advent of commercial atomic power in three ways:

- Learn the facts "so we won't be sold high-cost experimental white elephants."
- Be ready to act when the right time comes.
- Keep up with research in the field of rural electrification.

Other information in the report:

- Power needs of REA borrowers are expected to double by 1963, and triple by 1975.
- Integration of facilities between REA borrowers and private power companies is working out as a satisfactory solution to power supply problems of rural areas.
- During fiscal 1954, $167 million in electrification loans was made by REA to facilities serving more than 170,000 rural customers.

Storms Prompt Line Parley

Special meeting in Massachusetts takes up the problem of placing all distribution wires underground

At a recent meeting in Massachusetts, the economic burden of placing all utility distribution lines underground was discussed. A popular impetus for underground wiring has arisen in the state as a result of Hurricanes Carol and Edna. It is expected the incoming legislature will have to deal with this problem next winter.

Present at the meeting were Thomas Joyce, legislative counsel for the Massachusetts Gas & Electric Association (representing utilities throughout the state); Stanley W. Ellis, chief engineer, and Thomas M. Hayden, engineer of electric and water utilities of the Massachusetts Department of Public Utilities.

High Cost of Underground . . . Joyce stated that in the Bay State there are now about 10,000 miles of overhead lines, and that it would cost between $1 and 2 billion to put these underground. Figures on four recently completed projects give an average cost per mile of $120,000 to $211,000. Conservative investment companies state that to borrow $1 billion would cost about $170 million annually for interest and principal payments, taxes, depreciation, and insurance.

A study made last year in Connecticut indicated that it would cost at least 25 times as much for underground construction and that rates would have to be increased at least 500% to cover this. Recent figures gathered in Massachusetts revealed that the direct cost to 1.5 million consumers of providing underground connections from distribution lines to their buildings would be from $30 to $150 each, depending on the setback and type of construction needed.

Popular Resistance . . . Ellis stated Boston Edison Co has had a program in recent years to put 4 miles of wire underground annually in Boston, but so much popular resistance has been encountered that the program is now about 10 miles behind.

It was also brought out by Joyce that an additional cost must be met by cities and towns for street lighting poles when wires are placed underground. In the case of one small city this totaled about $1.5 million.

Hayden emphasized the greater speed with which overhead circuits can be dried out, and the longer time needed to locate faults in underground circuits, followed by digging up streets to get at the trouble. Alternate underground circuits would double the cost from the investment side, and require extra outlays for carrying future expanded loads ahead of their need.

BPA Resumes Stringing on McNary 345-Kv Line

Stringing of the 345-Kv transmission line on Bonneville Power Administration's McNary-Wishram project was scheduled to have been resumed Sept. 21 on an experimental basis while new procedures aimed at eliminating surface distortions are tested. BPA Chief Engineer Eugene C. Starr reported to Electrical World the changes from previous techniques are minor to the general operation which was outlined in EW, Sept. 13, p 16.

"Details that were minor to the general picture were not giving the results we want to obtain," Starr declared. He previously had stressed the fact that because of the inexperience with conductor of the size involved there was reason to expect "bugs" in the initial operation. "We prefer to put it all up right in the first place and hope the job will go faster later," Starr explained.

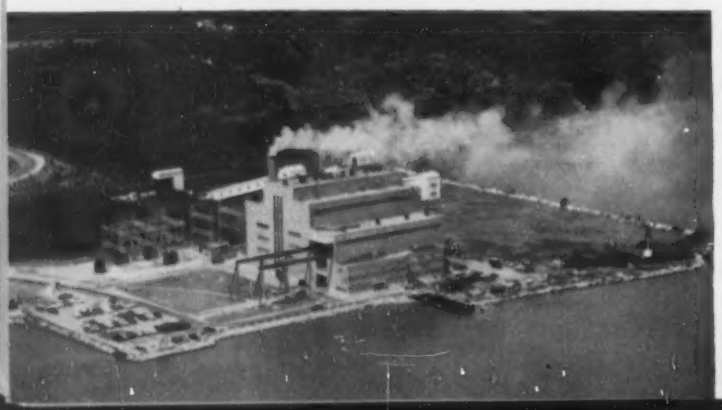
Engineers of the manufacturer, Aluminum Co of America, and the contractors, Bay Construction, Inc, and Don L. Cooney, Inc, both of Seattle, joined BPA engineers in formulating the new procedures which Starr reported resulted in improvements.

"We want to explore something," he added, and mentioned the work of the American Gas & Electric Co with conductor of about the same size in Ohio. Some of these experiences already have been utilized on the McNary-Wishram near McNary to Wishram, Wash. This line eventually will reach the Portland-Vancouver area.

Starr reported changes include rubber linings for the sheaves, for one thing, and pulling of the cable "under very careful control."

The operation is the first phase of stringing for the 176-mile line for which initial operation is set for November, 1955. Starr reported additional bid dates have been changed and work will be rebid on the remaining McNary-Ross sections. Bonneville also has super high voltage transmission conductor planned to link Chief Joseph powerhouse with the Puget Sound service areas. This involves 133 miles of double circuit line to Snohomish and 163 miles of single circuit of the Covington section.

Central Hudson's Danskammer Point Plant Doubles Output



Generating capacity of the Danskammer Point steam station was doubled this month when Central Hudson Gas & Electric Corp placed a second 70,000-kw turbine-generator into commercial operation, bringing plant's total capability to 140,000 kw. Addition of this generating unit boosts total capacity of Central Hudson System to 204,500 kw. Aerial view shows the $25-million station at Danskammer Point, N. Y., about six miles north of Newburgh on the west bank of Hudson River.

Slight Rise in Industry Fatalities

Report submitted to EEI Accident Prevention Committee shows 134 deaths in 1953 compared with 129 for 1952

Total fatalities in the electric light and power industry as well as those caused by electric shock and burns, were only slightly higher in 1953 than they were in 1952 according to a report submitted to the Edison Electric Institute Accident Prevention Committee at Philadelphia, Sept. 20-21.

The year's analysis of fatalities presented to the committee by S. H. Young, Hartford Electric Light Co, showed the total number of fatalities in 1953 were 134; up 5 over the number reported for 1952. Of this total 93 were electric shock and burn cases; an increase of 3 over 1952.

Hand Contact Cases Drop . . . Young pointed out that the number of hand contact cases in line work, which has been of great concern to the committee for many years, is showing improvement. In 1953 there were 14 such cases reported. This is 13 below the average of the six previous years. But arm contacts and contacts made while performing line work on the ground were still numerous, and greater effort to control these accidents must be made, Young said.

Of the 93 fatal electric shock and burn accidents in 1953, 71 occurred during the months of May through October. It is obvious, Young pointed out, that hot weather has a direct influence on this type of accident. A summary showed that there were 22 direct causes for the 93 electric shock and burn cases.

Approval of a specification for lineman's insulating safety hats, which had been under study for two years by a committee headed by C. A. Coutts, Northern States Power Co, was very nearly upset by a small group of members who asked that peaked caps as well as hats with full brim be included in the specification. The specification calls for such hats and caps to withstand an impact of 40 ft lb followed by a dielectric test of 15,000 volts.

Resuscitation Report . . . Dr W. B. Kouwenhoven, presented an interim progress report on counter shock resuscitation research at Johns Hopkins University. He told the committee that counter shock is producing good results in the laboratory in resuscitation experiments on dogs. Research to date, he said, indicates that to be successful counter shock must be applied within two minutes after the initial shock. Dr Kouwenhoven said counter shock methods now under investigation can be applied without damage to a normal heart that is not in fibrilation. He said that he had subjected himself to the electric shock employed in the research without injury. The Accident Prevention Committee voted to continue the research being conducted by Dr Kouwenhoven.

A 14-man accident prevention subcommittee, headed by Roy E. McCann, Southern California Edison Co, is currently surveying experience with linemen's equipment establishing specifications. Items undergoing study are:

1. Shapes and forms of gaffs on lineman's climbing irons.

CHAIRMAN R. P. Douglas, Detroit Edison Co addressing the recent meeting of the EEI Accident Prevention Committee

2. Conductivity of leather and fabric safety straps.

3. Plastics used in insulating lineman's climbers.

Film Showed . . . A 20-minute movie on the care and use of lineman's climbing equipment entitled "Lifeline of the Lineman," which had been prepared by Buckingham Manufacturing Co in cooperation with the Accident Prevention Committee, was reviewed and released during this meeting.

MEETINGS CALENDAR

EDISON ELECTRIC INSTITUTE

Prime Movers Committee, De Witt Clinton Hotel, Albany, N. Y., Oct. 4-5; Claims Conference, Hotel Cleveland, Cleveland, Oct. 5-6; Area Development Committee Organization Meeting, Hotel Statler, Cleveland, Oct. 6; Area Development Workshop, Hotel Statler, Cleveland, Oct. 7-8; Transmission and Distribution Committee, Sir Francis Drake Hotel, San Francisco, Oct. 7-8; Electrical Equipment Committee, Hotel Statler, Hartford, Conn., Oct. 11-12; Commercial Division General Committee Meeting, EEI Headquarters, New York, Oct. 15; Industrial Relations Committee in conjunction with North Central Electrical Association, Minneapolis, Minn., Nov. 18-19; Prime Movers Committee, Astor Hotel, New York, Nov. 29-30; Industrial Relations Committee, EEI Headquarters, New York, Dec. 16.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS

Middle Eastern District Meeting, Abraham Lincoln Hotel, Reading, Pa., Oct. 5-7; Fall General Meeting, Morrison Hotel, Chicago, Oct. 11-15.

NATIONAL ELECTRONICS CONFERENCE

10th Annual Conference, Hotel Sherman, Chicago, Oct. 4-6.

NATIONAL ASSOCIATION OF ELECTRICAL DISTRIBUTORS

Pacific Zone Convention, Mark Hopkins Hotel, San Francisco, Oct. 4-7.

INDIANA ELECTRIC ASSOCIATION

Annual Convention, French Lick Springs Hotel, French Lick, Ind., Oct. 6-8.

MISSOURI VALLEY ELECTRIC ASSOCIATION

Sales and Rural Conference, President Hotel, Kansas City, Mo., Oct. 6-8.

PENNSYLVANIA ELECTRIC ASSOCIATION

Fall Meeting, Systems Operation Committee, Alexander Hotel, Hagerstown, Md., Oct. 7-8; System Planning Committee, Lehigh Valley Club, Allentown, Pa., Oct. 11-12; Fall Meeting, Relay Committee, Hotel Alexander, Hagerstown, Md., Oct. 14-15; Fall Meeting, Electrical Equipment Committee, Hotel Robert Treat, Newark, N. J., Oct. 19-20; Fall Meeting, Communications Committee, Hotel Abraham Lincoln, Reading, Pa., Oct. 25-25; Fall Meeting, Transmission and Distribution Committee, Alexander Hotel, Hagerstown, Md., Nov. 4-5.

CONTROLLERS INSTITUTE OF AMERICA

Annual Meeting, Edgewater Beach Hotel, Chicago, Oct. 10-13.

INTERSTATE POWER CLUB

Meetings will be held at Hotel Martinique, New York, on following dates: Oct. 11, Dec. 6.

(*Continued on page* 138)

WASHINGTON COMMENT

JESSE MOCK

The Republican Administration is standing firm on its power policy declarations. What's more it is now attempting to seize the initiative on this issue that the Democrats have been pounding all year.

President Eisenhower's McNary Dam speech Sept. 23, sounded the first big guns for an all-out offensive to sell the GOP policy to voters. This was his full-length answer to the Democrats who rode the issue for all it was worth during the 13-day Senate filibuster on the Atomic Energy bill.

Republicans Stand Pat on Power Policy

The President's McNary Dam speech makes this much clear:

- The Administration recognizes power policy as one of the key issues in this fall's Congressional election campaigns.
- It is preparing to meet the issue head on, rather than gloss over it.

The speech ranks as Eisenhower's most important pronouncement on power and water policies since his 1952 campaign speech in Seattle. While the general theme is in line with the earlier speech, the President appears to have a surer grasp of specific problems bearing on the role of the federal government in water power development.

Issue in Perspective . . . This marks the first time since the Republicans came to power that the White House has taken on the task of explaining GOP power policy to the people. Previously this had been left up to Interior Secretary Douglas McKay and other lesser lights in the Administration. While some of their attempts were creditable, they never managed to command the wide public attention that the Democratic critics have attracted.

In his McNary Dam speech, Eisenhower states the issue on his own terms:

"The true issue posed to us is federal monopoly of power as against public or regulated private power freely chosen in each instance by the citizens of each area, with the federal government drawn in as a cooperating partner where this seems necessary or desirable."

This is a far cry from the broad characterization of the federal power crusaders who like to state the issue simply as "public vs private power." The President referred to these advocates as "zealots" and "enthusiastic disciples of centralized responsibility."

In the speech he also pointed to a major weakness of regional dependence on federal power generation—a weakness dramatically represented in the current Tennessee Valley Authority controversy.

Said the President: "A region which lets itself become completely dependent upon national funds provided by a Congress . . . frequently finds that the funds fail to keep pace with local needs."

This is a weakness which is gradually being recognized by once-enthusiastic backers of federal power. It has led such men as former Bonneville Power Administrator Paul J. Raver to cast around for an alternative to federal appropriations for electric generation expansion.

Restates Policy . . . With nearly two years experience behind him as chief executive, the President is now able to state more concisely and clearly his approach to power policy than he did during the 1952 campaign speech.

In his October 1952 speech in Seattle, Candidate Eisenhower said: "I am convinced, out of my experience with some very big jobs, that the way to do it is by sharing of effort, rather than by its concentration. That means the full use of private resources plus a local-state-federal partnership here in the State of Washington and the Northwest rather than dependence upon a daily directive from Washington, D. C."

In his recent McNary Dam speech, President Eisenhower states his policy in this way:

"We shall neither withdraw from the power field nor federalize all electric power generators in the United States.

"Where local enterprise can shoulder the burden, it will be encouraged and supported in doing so.

"But where local action cannot or should not fully meet the need, we shall have Federal action."

As these quotes indicate, there is nothing spectacularly new about this policy. It is the one which helped roll up Eisenhower's sweeping majorities in the 1952 election.

But the McNary Dam speech stands as the Administration's strongest and most forthright statement on power policy. Made as it was in the heat of the Congressional campaigns, it is a sure sign that the President is convinced not only of its fairness but of its political appeal as well.

TECHNICAL NOTES

ARCHER E. KNOWLTON

Starting time for a gas turbine is of the order of 3 to 6 min. Torque required for the acceleration is principally the friction and windage of the unit at the ignition speed.

World resources of uranium and thorium promise 22 times as much heat energy as those of gas, petroleum, and coal combined or 1800×10^{18} vs 80×10^{18} Btu.

Surface density of soil and its moisture (to 8 in. depth) is directly determinable in 3 to 5 min by a nucleonic equipment that employs gamma rays and slow neutrons.

Signals of a few millivolts at the carrier frequency must be extracted from a transmission circuit carrying 60-cycle energy at several hundred thousand volts. Ratio is about 10^8.

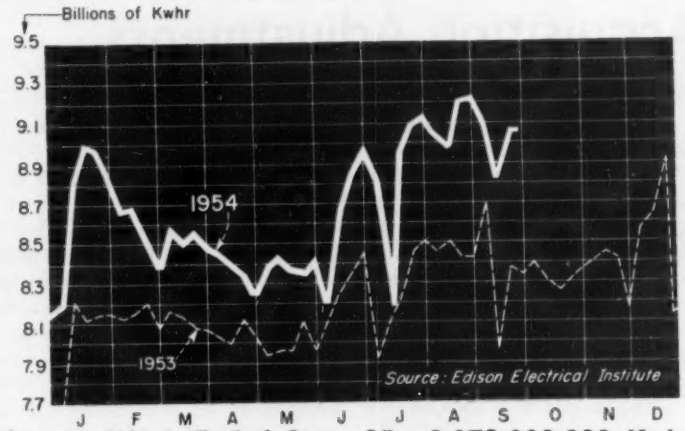
External disturbances need not trip off the plant auxiliary system if the latter is supplied from a shaft generator.

Plant building space is not increased by adoption of a shaft generator for auxiliary supply if it is placed in the space required for overhaul of the rotor of the main turbine.

Cross-compound generators present a greater problem in the event of loss of excitation because two field circuits are involved and resynchronizing is more difficult.

Enough radio frequency selectivity to permit unrestricted and uncoordinated use of many channels in a given area is not technically feasible unless the channels are, on the average, separated by about 1% of the operating frequency.

STATISTICS



Output Week Ended Sept. 25—9,072,000,000 Kwhr

Per Cent Change from Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
Sept. 25	+8.6	−0.4	+3.8	+0.7	+5.8	+19.7	+19.5	−1.5	+5.3	+7.2
Sept. 18	+8.1	−0.4	+5.4	+1.8	+4.6	+19.3	+13.5	−2.7	+6.3	+1.1
Sept. 11	+10.6	+0.2	+7.0	+2.8	+8.4	+22.0	+30.0	−0.8	+3.6	+1.0

Seasonally Adjusted Index† 173.0 Week Ago 172.0 Year Ago 159.3

Electric Power Statistics

		Latest Month	Preceding Month	Year Ago
Peak Load‡ (Million Kw)	June	78.0	74.0	73.0
Capacity (Million Kw)	July	96.98	95.31	86.11
Production (Billion Kwhr)	July	40.08	38.90	38.03
Hydro	July	8.76	9.59	8.75
Fuel	July	31.32	29.31	29.28
Fuel Consumption:				
Coal (Million Tons)	July	9.40	9.29	9.59
Oil (Million Barrels)	July	4.45	4.29	6.34
Gas (Billion Cu Ft)	July	113.20	107.79	109.35
Sales (Billion Kwhr)	July	32.99	32.57	32.13
Residential	July	9.50	9.32	8.47
Commercial	July	6.52	6.04	5.81
Industrial	July	14.35	14.85	15.50
Other	July	2.62	2.36	2.35
Net Income Class A & B Companies ($ Million)	July	84.47	86.76	73.12
Estimated Dec. '54 Peak ‡(Million Kw)	July	88.1	88.1	91.9
Kwhr per Residential Customer (12 Month Average)	July	2,458	2,441	2,272
Revenue per Kwhr Residential Service (12 Month Average)	July	2.71¢	2.71¢	2.75¢
Canadian Production (Billion Kwhr)	June	5.67	5.93	5.26

Business Statistics

FRB Industrial Production Index†	Aug.	124*	116	136
Gross National Product Annual, Rate ($ Billion)	2nd Qtr.	356.0	355.8	369.9
EW 4 Industry Production Index†	Aug.	114.9	114.2	125.8
ENR Construction Cost Index††	July	135.0	130.5	126.6
BLS Consumer's Price Index	Aug.	115.0	115.2	115.0
NEMA Insulation Materials Sales Index†	July	92	124	150
NEMA Electric Appliance Sales Index†	July	88	102	86
NEMA Household Refrig. Sales Index†	July	93	82	87
Metal Prices (Sept. 28)				
Copper, Conn., V., lb		$.30	$.29¾	$.29⅓
Lead, N. Y., lb		.14¾	.14¼	.13½
Zinc, prime Western E. St. Louis, lb.		.11½	.11	.10
Tin, Straits, qual. N. Y. lb		.93⅜	.93⅛	.82½
Aluminum, ingot, base price		.21¼	.22¼	.21½
Nickel, base price		.60	.60	.60
Steel, billets, Pitts., ton		64.00	64.00	62.00
Steel, scrap, No. 1 heavy, Pitts., ton		30.00	29.00	41.00

*Preliminary ** Revised ‡Class 1 Systems †1947-49=100 ††1949=100

Power Company Revenue Over $7 billion in 1953

The financial picture for the nation's privately-owned electric utilities showed a total of over $7 billion in operating revenues last year. This was a 9% increase over the 1952 figure of $6½ billion. Revenues from electric operations alone amounted to $6.2 billion—86% of total, and again a 9% gain over 1952's $5.7 billion. Net income for all departments increased not quite 9%, from $947 million in 1952 to $1,030 million at year-end 1953.

Operating revenue deductions—charges for operation, maintenance, depreciation and taxes, amounted to $5,818 million for the year, and in relation to revenues, showed a drop from 81.8¢ per revenue dollar to 81.5¢. For electric departments alone, the figures amounted to $4,946 million in total deductions, leaving a net revenue figure of $1,222 million which is 10.9% higher than the 1952 figure.

In relation to revenues, electric department deductions were at the rate of 80.2¢ per revenue dollar. Of this, 49.6¢ went for operating expenses, 9.1¢ for depreciation, 13.0¢ for federal income taxes, and 8.5¢ for other federal, state and local taxes.

Composite Income Account
(Class A and B Companies)

	1952 (000$)	1953 (000$)
Operating revenues	$5,660,417	$6,167,257
Operating expenses	2,839,367	3,060,291
Depreciation and amortization	508,039	559,680
Taxes: Federal taxes on income	728,404	798,776
Other taxes	483,026	526,944
Total operating revenue deductions	4,558,836	4,945,691
Net operating revenues	1,101,581	1,221,566
Income from electric plant leased to others	3,063	2,343
Electric utility operating income	1,104,644	1,223,909

Source: Federal Power Commission

Increasing the net revenue total by the amount representing electric plant leased to others, brings the total electric department operating income to $1,224, or a 10.8% increase over the 1952 figure of $1,105. The corresponding total for all departments in 1953 amounted to $1,321 million.

Court Rules on 'Acquisition Adjustments'

In a decision of far-reaching importance, the Superior Court of Pennsylvania ruled on Aug. 30, 1954, in a case involving the Pennsylvania Power & Light Co and the Pennsylvania Public Utility Commission, that the ratepayer should not be called upon to pay for the amortization of plant acquisition adjustments. If such amortization is necessary, then, the court said, it is a charge against the stockholders of the company.

The opinion delivered by Justice Hirt raised the question: "May the company recoup from the ratepayers by a process of amortization an amount in excess of $25 million paid by the company, on the purchase of various utility companies, over and above the total of their depreciated original cost?"

Cost Evaluated

The opinion continued: "We are concerned primarily with account 100.5 in the uniform system entitled Electric Plant Acquisition Adjustment Clause. In this account the company was required to include 'the difference between (a) the cost to the accounting utility of electric plant acquired as an operating unit or system by purchase, merger, consolidation, liquidation, or otherwise, and (b) the original cost, estimated if not known of such property, less the amount or amounts which may be credited to the depreciation and amortization reserves of the accounting utility at the time of acquisition with respect to such property.' In this case the account was intended to disclose the amount in excess of depreciated original cost which was paid by the company for the utilities purchased by it. On Dec. 19, 1944, the commission in an accounting proceeding initiated by it found that $25,930,-121.01 was classifiable in account 100.5 under Electric Plant Acquisition Adjustments. The Federal Power Commission had previously classified the same amount in the same fashion. And both commissions ordered that the amount be written off the books of the company by amortization over a 15-year period at the rate of $1,746,-150 per year. There was a vital difference, however, in these two orders: The Federal Power Commission directed that the amount be written off by charges to 'Miscellaneous Amortization' as a disposition of income; the Pennsylvania commission directed the amortization by charges as operation expense. And in the instant proceeding the commission made final its tentative order of Dec. 19, 1944, and thus put the burden on the present ratepayers of providing $1,746,150 annually over a 15-year period in addition to a return of a maximum of 5.82% on fair value of $310 million in accordance with the findings of the commission. We are agreed that there is palpable error in the order in this respect."

The opinion went on to say, "And in the present case if the company, more than 20 years after the purchases were made, may collect from the present ratepayers the excess costs appearing in its account 100.5, there is no apparent obstacle to the similar recoupment by other utilities of like payments."

The opinion noted significantly with respect to the fact that these costs are nondeductible for tax purposes that ". . . although the commission elsewhere stated that the classification of the amount in account 100.5 was 'not a controlling factor in rate adjudication' yet in the present case the commission treated its amortization as an expense for rate purposes to be borne by the ratepayers in addition to a fair return on the rate base. In so doing it is clear that the commission has projected its accounting determination into the field of rate regulation and it should be noted that the burden imposed on the ratepayers by the present order is much greater than the annual amortization payment itself. The payment is not deductible for tax purposes and it is probable that in order to produce a net of $1,746,000 after taxes, the ratepayers would have to pay more than twice that amount annually. This is the equivalent of a further increase in the rate base. In Lindheimer v. Illinois Bell Telephone Co, 292 U. S. 151, 164, 54 S. Ct. 658, it is said: 'Charges to operating expenses may be as important as valuations of property. Thus, excessive charges of $1.5 million to operating expenses would be the equivalent of 6% on $25 million in a rate base.' In the present case the annual charge involved is much more than $1.5 million."

The opinion continued: "What the company bought with the excess paid above original costs were intangibles and the commission in effect so found. As present 'going concern value' or increased earning power the intangibles were properly considered by the commission in determining the fair value of the entire property as a rate base; the expectation of increased earnings was not unreasonable in the light of the potential operating efficiency of a large integrated plant.

'Pre-emptive Value'

"At most the amount classified in account 100.5 represents 'strategic or pre-emptive value' beyond original costs paid by the company, in anticipation of increased earning power. Insofar as that expectation has not been realized the improvidence of the expenditures was that of the stockholders and cannot be charged to operating expense. In any view, except to the extent that the intangible values contribute to the fair value of the whole, the ratepayers cannot be compelled to pay a return on the investment, much less restore to the company the excessive price paid, through the device of amortizing the cost as an operating expense. Intangible values of this type do not depreciate or wear out; the company still has them, although earnings may fluctuate. There is no good reason why the amount paid for these intangible values may not remain permanently on the books of the company. And if the excess payments are to be amortized the method adopted by the Federal Power Commission is the proper one; as an accounting measure the excess is logically chargeable to the stockholders against gross income and not to the ratepayers as operating expense."

In a dissenting opinion Justice Gunther notes that "it is clear that this order does nothing more than to permit the company to depreciate on the basis of the actual cost of acquisition. The

appellants contend that this makes the allowance of expenses and the cost of service dependent on the fortuitous occurrence of a sale or transfer of the utility property, in the absence of which there would be allowed only the annual depreciation based on original cost. This argument overlooks the fact that the sales or transfers were in the public interest and resulted in benefits properly paid for by the consumers. . . . The company's acquisitions were much more than mere fortuitous occurrences, but were approved by the commission as of benefit to the public, on whom should properly fall the costs of such benefits.

"It is also contended that the courts have held that annual depreciation must be based solely on original or historical cost. The book cost in this case would be the costs of acquisition of various other utilities, which costs were previously determined to be fair and reasonable. Since the present system of accounting permits depreciation on original cost only, the amortization of the excess between original cost and cost of acquisition is necessary, in order to depreciate the entire book cost and thereby insure the return of the actual capital outlay."

The company has said that it will appeal this decision.

Pacific P&L Holders to Vote on New Stock

Stockholders of Pacific Power & Light Co will vote Oct. 19 on a board proposal to authorize 200,000 additional shares of 5% preferred stock of $100 par value. Pres Paul B. McKee told the stockholers in an explanatory letter that the stock would be issued in series and sold as needed to finance construction allied to the company's expanding business in the Pacific Northwest. The date is the annual stockholder meeting.

PP&L's currently authorized 126,533 shares of $100 par value 5% preferred has been issued.

McKee reported the company's construction program this year involved some $11,857,000 and for 1955 the investor owned utility expects capital needs will be $12,898,000.

Stockholders will also elect a board of 21 directors, reflecting the enlarged board resulting from merger of PP&L and Mountain States Power Co.

(*More Financial on page* 166)

Today in Utility Finance

YIELDS (%)

Quality	Bonds			Preferred Stocks			Common Stocks		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
DATE									
Sept. 23	**2.88**	**2.91**	**3.10**	**3.90**	**4.02**	**4.39**	**4.48**	**4.77**	**5.15**
Sept. 16	2.88	2.92	3.11	3.91	4.04	4.40	4.49	4.75	5.16
END OF QTR.									
2nd 1954	2.90	2.96	3.19	4.03	4.14	4.48	4.72	5.04	5.45
1st 1954	2.82	2.87	3.14	3.88	4.09	4.42	4.83	5.19	5.42
4th 1953	3.07	3.12	3.34	4.17	4.32	4.62	5.07	5.57	5.51
3rd 1953	3.30	3.33	3.54	4.35	4.52	4.83	5.36	5.57	6.01

Data: Reis & Chandler, Inc.

EARNINGS

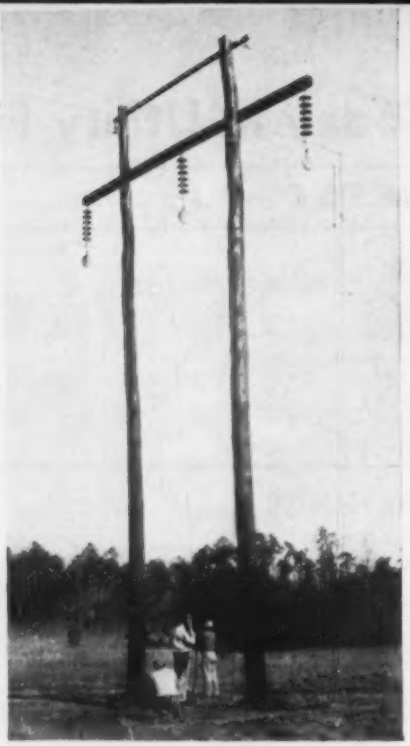
Company	Period Months Ended		Net Income 1954	Net Income 1953	Earnings Per Common Share 1954	Earnings Per Common Share 1953
Carolina Power & Light	12	Aug.	$7,776,898	$7,230,450	$....	$....
Central Illinois Light	12	Aug.	3,503,260	3,436,164	3.00(a)	3.26(a)
Central Illinois Public Service	12	June	6,406,831	5,538,690	1.62(b)	1.53(b)
Central Vermont Public Service	12	Aug.	1,133,611	1,019,717	1.02(c)	1.05(c)
Houston Lighting & Power	12	Aug.	12,018,365	10,142,799	2.20	1.95
Minnesota Power & Light	12	Aug.	3,631,374	3,994,586	1.78(f)	1.99(f)
New York State Electric & Gas	12	Aug.	9,517,923	8,449,847	2.65(g)	2.67(g)
Oklahoma Gas & Electric	12	Aug.	6,279,028	6,072,186	1.96	1.96
Portland General Electric	12	Aug.	4,105,418	3,698,055	1.37	1.23
Shawinigan Water & Power	6	June	3,116,709	2,967,546	1.19	1.12
Utah Power & Light & Subsidiary	12	July	5,172,883	5,086,071	2.53(h)	2.76(h)

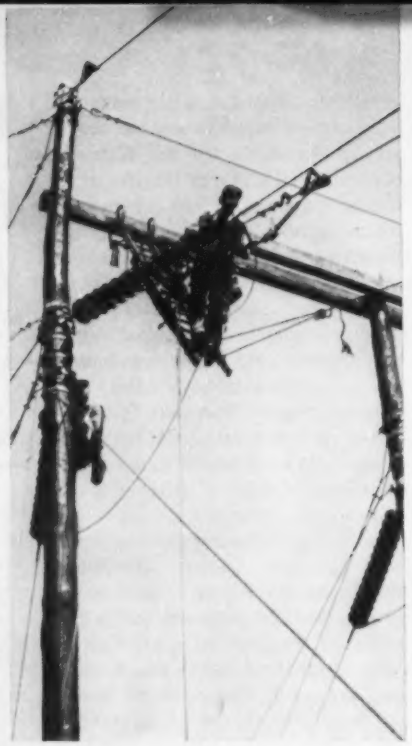
Notes—(a) Based on 1,000,000 shares in 1954 and 900,000 shares in 1953; (b) Based on 3,293,600 shares in 1954 and 2,943,600 shares in 1953; (c) Based on 867,141 shares in 1954 and 779,774 shares in 1953; (f) Based on 1,716,094 shares outstanding in 1954; (g) Based on 3,034,068 shares in 1954 including 337,118 shares in Oct., 1953 and 2,696,950 shares in 1953; and (h) Based on 2,042,500 shares.

FINANCING

Company and Description	Amount of Offering ($000)	Offering Price	Yield to Public
WEEK OF SEPTEMBER 23-29			
Bonds			
Northern States Power (Minn.)—1st mtg 3¼% due 1984	$20,000	102.261%	3.01%
Vineland, N. J.—electric plant due 1955-74	3,500	various	0.75-2.1%
Western Massachusetts Electric—1st mtg 3½% due 1984	6,000	101.467%	3.05%
Columbus & Southern Ohio Electric—1st mtg 3¼% due 1984	10,000	102.915%	3.10%
Common Stock			
New England Electric System—910,883 sh (being offered commonholders on a 1-for-10 basis, record Sept. 29 to expire Oct. 14).	13,663	$15.00	6%
SCHEDULED FOR OCTOBER—NOVEMBER			**Bid Date**
Bonds and Debentures			
Denton, Tex.—electric revenues due 1955-84	$4,300	.....	Sept. 30
Public Service Co of Colorado—1st mtg due 1984	20,000	.....	Oct. 4
Wisconsin Power & Light—1st mtg due 1984	18,000	.....	Oct. 4
Indiana & Michigan Electric—1st mtg due 1984	16,500	.....	Oct. 5
Metropolitan Edison—1st mtg due 1984	15,000	.....	Oct. 5
Gladstone, Mich.—electric revenues due 1957-84	2,100	.....	Oct. 5
Savannah Electric & Power—1st mtg due 1984	5,000	.....	Oct. 13
Savannah Electric & Power—debs due 1979	3,000	.....	Oct. 13
Wisconsin Public Service—1st mtg due 1984	12,500	.....	Oct. 14
Texas Power & Light—1st mtg due 1984	20,000	.....	Oct. 18
Louisiana Power & Light—1st mtg due 1984	18,000	.....	Oct. 20
Florida Power Corp—1st mtg	12,000	.....	Oct. 26
Florida Power & Light—1st mtg due 1984	25,000	.....	Oct. 27
Sierra Pacific Power—1st mtg due 1984	4,000	.....	Nov. 9
Cleveland, Ohio—electric revenues	5,000	.....	.....
Wisconsin-Michigan Power—1st mtg	3,000	.....	.....
Central Louisiana Electric—conv debs due 1964 (to be offered to common stockholders on the rate of $100 deb for each 27 common shs then held)	3,772	.....	.....
Preferred Stock			
Indiana & Michigan Electric—40,000 sh $100 par	$4,000	.....	Oct. 5
Mississippi Power & Light—44,476 sh $100 par (to be offered in exchange for outstanding $6 pfd on a sh-for-sh basis, plus a cash difference between initial public offering price of new shares and redemption of the old shares; offer will expire Oct. 28)	.....	.....	Oct. 13
Savannah Electric & Power—30,000 sh $100 par	3,000	.....	Oct. 26
Common Stock			
Sierra Pacific Power—34,807 sh (to be offered commonholders on a 1-for-10 basis and preferred holders on a 1- for-5 basis, record Oct. 5 to expire Oct. 22)	.....	.....	.....
Hawaiian Electric—50,000 sh (to be offered commonholders on a 1-for-13 basis)	.....	.....	.....
Virginia Electric & Power—600,000 sh (to be offered commonholders on 1-for-10 basis)	.....	.....	.....
ISSUES RECENTLY POSTPONED			
Bonds			
Consolidated Edison Co of New York—1st mtg due 1984	50,000	.....	.....(a)

Note—(a) Temporarily postponed.





Sagging in after second conductors are installed in dolly blocks. At right, pinning second conductor to yoke assembly after making up pressed dead-end body on the ground

Conductor Bundling Methods and

W. L. RUSH, Transmission & Distribution Engineer, GENE LANCASTER, Engineer, Louisiana Power & Light Co, New Orleans, La.

An economic study and the construction of a 3-mile "test line" have provided the cost data and know-how to prove that bundling of existing 110-kv transmission lines is very promising for Louisiana Power & Light Co.

When the original parts of Louisiana Power & Light Co's 115-kv transmission system were being built, 20 and 30 years ago, 2/0 and 4/0 ACSR were used for the conductors. At the time, these sizes were large enough to carry the loads that could be visualized for the areas. Later it was decided to standardize on a "large" conductor; so subsequent lines were built of 336,400-CM ACSR. By 1950, 666,600-CM ACSR was being used on main lines, and it was evident that the old lines would soon be overloaded.

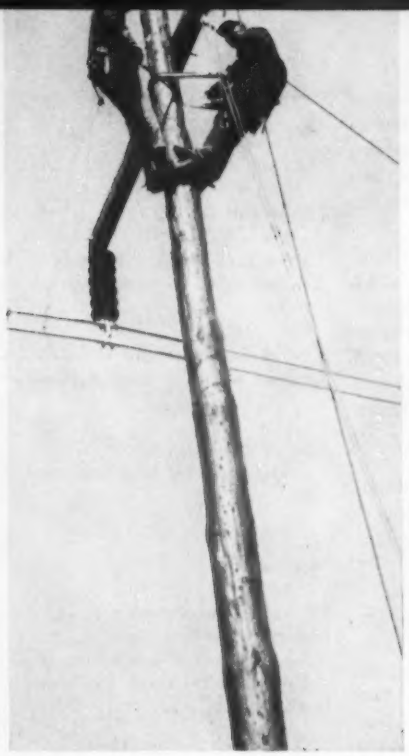
About this time it became necessary to build a 90-mile line across north Louisiana. Although the company had just started to use the 666,600-CM conductor on main lines it was realized that in this instance 336,400-CM ACSR would be adequate for about ten years. Immediately, the question was whether to go ahead and invest in a large conductor that would not be needed for ten years or to put up 336,400-CM ACSR and change it when it was outgrown.

Economic Study . . . As the entire conductor situation was becoming acute, it was decided to make an economic study to decide what should be done in this case, also what should be done with the old lines that had been outgrown. It was concluded that the 2/0 ACSR lines should be reconductored but that the 4/0 and 336,400-CM ACSR lines should be bundled if it could be done at a reasonable cost. It remained to be determined how the bundling should be done, what spacing should be used, and whether bundled conductors should be spaced horizontally or vertically.

Steps were taken to underbuild a conveniently located line with four 336,400 CM ACSR conductors. Adjustable spacers of 3 in., 6 in., 9 in., and 12 in. were used, and two wires were supported horizontally and two vertically. Current was fed into the center of the test section, and tests were made to determine what currents were required at the different spacings to pull the conductors together and what currents were required to hold them together.

Test Results . . . These tests indicated that a 9-in. vertical separation should be used and that the 90-mile section of line would be built with the 336,400-CM ACSR conductor. Construction standards were examined, and the small angle structure modified; that is, the crossarm was shifted 6 in. to compensate for insulator swing with the extra conductor 9 in. below the first. A dead-end yoke was developed that was the length of two suspension insulators.

As a result of these design modifications, Louisiana P&L has proceeded to construct lines with small conductor whenever they were adequate for the near-term load. However, two extra insulators are added in the dead ends so that when the line is bundled, the 14 15,000-lb ball-and-socket type insulators can be replaced with 12 25,000-lb clevis type insulators. X-braces are to be added to each structure and additional guys added at angle points.



Preformed spacers were installed at mid-span in only four spans to determine if they were needed. Completed bundled conductor assembly, at right, has ground wire for safety

Costs Proved on Louisiana Test Line

To test this "theory" in actual practice, a 3-mile section of 110-kv line was selected that included several angles and dead ends and about 100 ft difference in elevation.

Labor Cost Low . . . Although this job was begun with some trepidation, it proved to be much easier than had been expected. The entire labor cost was almost an even $1,000 per mile. This cost was highly satisfactory when it was considered that, in addition to stringing the wire, it included additional guying, adding X-braces to each pole, modifying the suspension clamp to add another one below it, changing dead-end assemblies, and adding the strain yoke test, pulling the conductors, and matching existing sag. Also included was the indoctrination. On a long line this would not be serious; but when it is considered that acquiring the "know-how" was charged in this three-mile line, the costs were remarkable.

Modifications . . . The company's standard "H" frame construction, modified, was used in the construction of this line. The modifications made provisions so that in the future a second 336,400-CM ACSR could be added to each phase to form a bundled conductor consisting of two 336,400-CM ACSR conductors spaced 9 in. in a vertical arrangement.

The ruling span is 600 ft. The insulators consist of 6 units in suspension and 12 units in side-tension, 15,000-lb, 5¾-in. ball and socket type. Tension insulators are installed with 14 units to provide space for future bundled conductor assembly.

Three-Mile Test Section . . . Terrain of the three-mile section of this 110-kv line was low, rolling, sandy hills, studded with pine trees. The angles range in size from 4 to 24 deg. Crossings required to be made in this line section were a dirt road, a gravel road, a paved highway, a railroad, a communication line, an 8-kv power line, and three creeks. This section was purposely chosen to incorporate various type angle structures in order to reveal any problems that might arise in adding this second or subconductor.

The possibility of having to add the subconductor, with the original line energized was not considered. This work was planned to be performed under formal clearances. The present and planned system network allows for a section of the line at a time to be de-energized when the situation warrants adding the second conductor.

Stringing Conductor . . . Initially, a crew of two linemen and four helpers preceded the stringing crew installing stringing blocks and spacer straps. The pin in the original suspension clamp is replaced with a pin of greater length which is necessitated by the addition of two straps, one on each side of the clamp.

The stringing block is pinned to the lower ends of these straps. This positions the conductor, when laid up in the dolly blocks, 11 in. below the top conductor instead of the desired 9 in. This is negligible except at angles, where it is necessary to position the conductor at its correct 9-in. spacing.

Stringing was done in the conventional manner with the subconductors laid up in dolly blocks at each structure. At angles it was necessary to lay the wire in a dolly block attached to each pole rather than attached to the end of the insulator assembly. At angles the conductors were laid out in position after prestressing. To elimi-

nate this extra handling of the wire; a special type dolly block with a universal joint arrangement would have been required had the wire been laid up initially in a block attached to the insulator assembly.

Because the straps between the dolly block and original suspension clamp were rigid, they would not permit the dolly block to swing in an arc to compensate for the changing position of the subconductor as the tension was varied from no tension to prestressed tension.

Crews . . . The dolly block installation crew of two men and four helpers averaged 2½ structures per hour for a total of 20 structures a day in installing the blocks. The wire stringing crew consisting of a foreman, two linemen, four helpers, one tractor driver, and a swamper strung the three linear miles of conductor in two days. The conductor was then hauled spotted, and mounted in reel bucks on wagons by an additional three men.

Stringing the second conductor across hot lines or busy highways can be made easier by using the existing conductor as a messenger. However, it is not recommended to replace guard poles except where used in addition to guard arms and poles.

Three sags were made. The first had only three spans because of the proximity of two dead-end structures. The second sag included 1½ miles, and the last sag included the remaining one mile plus section. The intermediate sag was caught off on a tangent structure. Five temporary anchors were installed at this structure for holding the completed sag and in order to back up the next prestress operation.

As the wire was pulled up to prestress tension, it rode by the side of the existing wire. At mid-span, the prestressed subconductor was above the existing conductor. This operation was watched closely at every point on the line for fear that the two conductors would wrap around each other and become entangled. Although the two wires did wrap temporarily in passing one another, at no point did they fail to separate into their respective positions. This experience showed that prestressing of the subconductors could be accomplished in position to speed over-all operation.

Pole Bands . . . Recommended for use at dead-end points are heavy pole bands and 25,000-lb insulators with the bundled conductors. The heavy pole bands were installed during initial construction; therefore the installation cost of these bands is not included in the cost of this operation. However, this is a minor operation which can readily be performed at the time of replacing the 14 15,000-lb insulators with the 12 25,000-lb insulators and yoke assembly. Holding tension on the existing conductor with a winch cable passing through a snatch block attached to the pole and thence to the conductor grip, the 15,000-lb insulators can be easily replaced.

Sagging . . . Great care had to be exercised in sagging and dead-ending the second conductor so that its sag would conform to that of the existing conductor. Sagging was done by the "stop watch" method and also by comparing the return beats of the two wires when pulled on simultaneously. Ample time was allowed for the conductor to run through the dolly blocks to equalize the tension throughout the entire section being sagged.

To be sure that both wires would be the same length, the length of the dead-end insulator assembly was disregarded and the second wire marked opposite the dead-end body of the existing wire using a plumb bob line hanging from the top wire. The subconductor was then lowered to the ground. The wire was cut short of its mark by the length of a 6-in. turnbuckle and figure-eight link. This turnbuckle was inserted between the dead-end body of the lower conductor and the yoke assembly. This permitted a fine adjustment to the sag of the lower conductor and also provided an adjustment should the need for an adjustment arise some time in the future. A need for this type adjustment could arise if the two wires did not stretch uniformly over a number of years.

A second operation prior to bundling was adding a second log anchor and guy at each phase dead-end point. This added anchorage is necessary when adding the second conductor. This was done in order to spread the two guys and anchors rather than have the guys and anchors in line. Knee braces were added to strengthen the crossarms on the small angle (2 to 8 deg) structures.

(*Continued on page* 168)

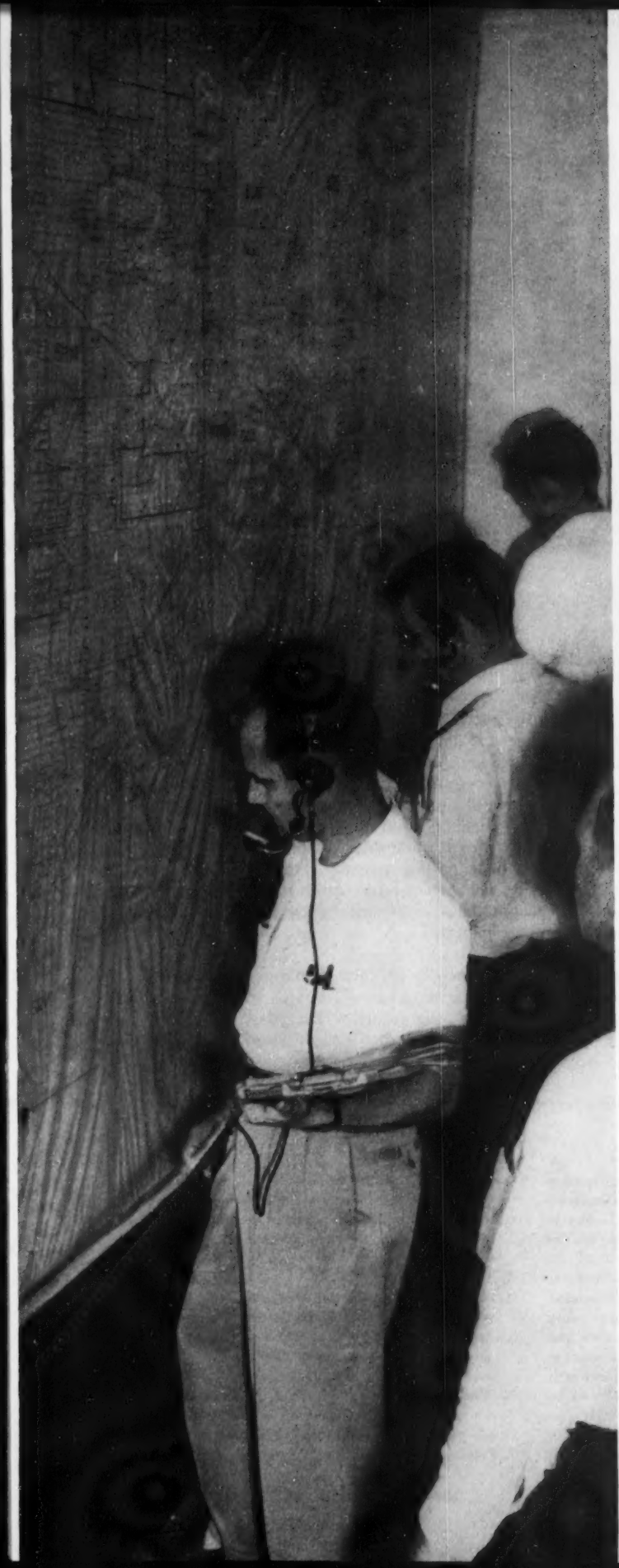
COSTS OF OPERATION

Labor and Material

Cost of knee-braces, X-braces, pole hardware	$526.93
Contract work for installation of above	780.73
Total	$1,307.66
Cost of insulators and clamps	$1,404.55
Contract work for installation of above	268.10
Total	$1,672.65
Cost of conductor	$3,910.13
Contract work for installing conductor	2,436.31
Total	$6,346.44

Overhead

Preliminary Engineering	$10.37
Inspection Salaries	257.97
Inspection Traveling & Living Expenses	70.70
Telephone & Telegraph Expenses	42.15
Insurance	68.92
Total	450.11
Total Constr. Accounts	9,326.75
Total Project	$9,776.86



Preparation for storms is key to . . . .

How Florida P&L Restores Service

The storm restoration program developed by Florida Power & Light Co has demonstrated its ability to return the system to normal, following weather upheavals, days sooner than otherwise would have been possible. Increased efficiency of crew routing alone has materially cut the time required to restore service. As a result, it is estimated that revenue recovered and reduced labor costs in the Miami area alone fully justify the $50,000 annual training cost involved to handle a storm once in ten years. But the biggest return to the company has been the increased confidence of customers and governmental officials.

Orderly Restoration . . . Utter confusion need not follow a major storm. The key to orderly restoration lies within the grasp of those willing to pay the price for preparedness. The objective of any storm program must be to restore service as quickly and safely as possible. But equally important are requirements that:

1 Service be restored in the sequence most beneficial to public welfare, and

2 Public be kept informed of work progress.

THE AUTHORS

GEORGE KINSMAN, Operating Vice President,

J. A. LASSETER, Superintendent of Distribution,

J. W. BEVILLE, JR, Distribution Engineer,
Florida Power & Light Co, Miami, Fla.

A record breaking job of restoring service can be done from an operating viewpoint and still end up with the public and governmental officials up in arms. Heroic efforts to restore service will be cheered quickly only by an informed public.

Miami Pattern . . . Details of the FP&L procedure vary with the size of the town or area involved, but generally, the program follows the pattern set up for Miami. This region is divided into 25 areas for storm restoration purposes. In most cases, the area served by one substation constitutes a storm area having about 10,000 customers.

Arrangements are made on a semi-permanent basis for a headquarters within each area. Where possible, headquarters are located on company property. Each is equipped with jacks for two plug-in types telephones, map boards, suitable tables, chairs, etc, and provisions for emergency radio communications.

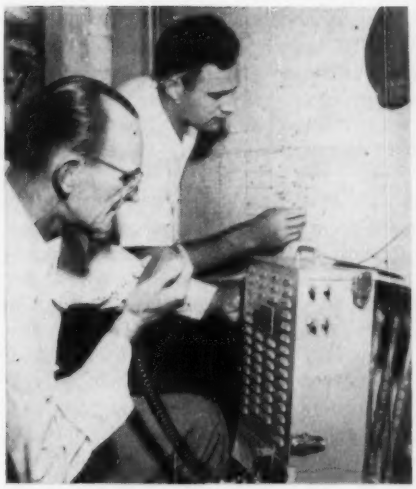
To each area are assigned a supervisor, one or two commercial representatives, one or two clerks, and sufficient men to patrol all main lines within a 4-hr period. In most cases, a person's storm assignment is entirely different from his normal work. Most of the area supervisors are from engineering departments. Patrolmen may be young engineers, metermen, or draftsmen. Almost everyone not normally assigned to the line department is given a special storm assignment.

Area Supervisor . . . The area supervisor is responsible for speedy and safe restoration of service and reconstruction of property in assigned areas. He has sole responsibility for switching within the area and supervises all head-

TWELVE LESSONS LEARNED

1. **Decentralization:** The normal operating organization bogs down if loaded with manpower necessary for storm restoration work. Work must be decentralized and complete authority given to the smaller groups.
2. **Unit of Measure:** A practical unit to measure initial damage must be established to determine manpower and material requirements. Inventory of individual poles and wires down is too slow and costly in manpower. Verbal accounts of damage are too inaccurate. The number of blocks in which primary damage of any type is noted appears to be a satisfactory compromise.
3. **Clearing Usable Lines:** Miles of usable main lines can be held out of service for extended periods by damage to laterals if linemen are tied up on large crews engaged in major reconstruction work. Initially, five two-man crews can restore more service than one ten-man crew, unless damage to main lines is extremely severe.
4. **Size of Crews:** Size of crews must be flexible. Additional transportation and tools to form small crews from large ones should be prearranged.
5. **Assignment of Work:** Crews should be given specific work orders rather than blanket orders to patrol and repair damage found.
6. **Working Hours:** Daylight to dark operations are the maximum for efficient operation. Longer periods burn out personnel and slow down restoration.
7. **Personnel:** Fears that personnel available for

IN INFORMATION CENTER (at left) scores of employees receive damage reports and guide all phases of restoration in the field and at area headquarters (below)



quarters personnel and dispatches all crews.

The area commercial representative is responsible for guiding the area supervisor in all matters affecting customer relations. He makes such customer contracts as may be necessary within his area to keep the supervisor informed of critical situations.

Immediately following a storm, the area personnel report directly to their respective headquarters, and the supervisor reports to the dispatcher that he is "taking over." The patrolmen immediately start patrolling pre-assigned circuits. The first objective is to clear intact main primary lines of minor damage and isolate damaged laterals.

Thus, the patrolman does not write up work orders to repair damage. Instead, he makes a fast patrol and prepares a "Clearing Order" on which he lists the switches and transformer fuses that are to be opened, lines that are to be cut, or other work that can be done by one man plus helper to clear that particular section of main line.

The line crews sent out to various headquarters for assignment of work are all furnished extra vehicles (usually rented immediately prior to the storm) so that the area supervisor can convert a single ten-man crew into five two-man crews. These two-man crews immediately start working the "Clearing Orders" so that main lines with no major damage can be energized. We consider this a major advancement over previous procedures. In the past, miles of virtually undamaged main line were held out of service for extended periods by uncleared damage to laterals.

This resulted from using the majority of manpower on reconstruction rather than clearing work. In many cases major damage on main lines can be by-passed by ties to other feeders if all usable main lines are cleared and

assignment to areas as supervisors or patrolmen would not be qualified to direct crews, perform switching, etc., were mostly unfounded. Personnel assigned to areas from outside the Operating Department have done surprisingly good jobs under pressure and are respected by Operating Department "regulars."

8. **Public Information:** A rapid restoration job is, in itself, insufficient. The public, and particularly commercial enterprises, must be kept informed so they can plan accordingly. This need must be appreciated by field forces to obtain the necessary cooperation.
9. **Procedure:** The procedure must be written out in detail for every man. Specific assignments by name must be made and must be kept current.
10. **Training:** All levels of management must recognize that training is vital and not allow other duties of assigned personnel to overshadow the importance of attending scheduled meetings. Training must be planned and made interesting. An annual "dry run" is considered necessary.
11. **Preparation:** All tools, maps, office supplies, communication facilities, lots for parking trucks, emergency storeroom locations, and the other many details must be arranged for and checked prior to the storm season.
12. **Forms:** In general, forms for normal operation are unsuitable for storm restoration work. Special forms save time and simplify procedure.

energized as quickly as possible. Immediately upon completion of the task of clearing usable main lines, crews are re-formed by the area supervisor as necessary, and major reconstruction of the primary is started.

In the meantime, patrolmen have been making complete patrols of the primary and preparing work orders for reconstruction work. Upon restoration of the primary circuits, work is started on the secondary and services. At this latter stage, the need for large crews again diminishes; so many of the large crews are made into two-man service crews to work on individual services.

Area Headquarters Map . . . Thoughout the entire restoration procedure, the area supervisor routes his crews from a map in area headquarters on which all damage is posted with colored pins from work orders prepared and brought in by the patrolmen. The pins show damage only by type of crew required. One work order includes all primary damage within one block, and its number is written on the map beside the associated pin so that it can be quickly located in the file when ready to be worked. Similarily, all damage to the secondary and services fed from one transformer is shown by means of symbols on one work order and is posted to the map by one pin.

Customers such as water plants, hospitals, wholesale milk concerns, and others of a similar nature without standby plants that are essential to the health, safety, or welfare of the community are classed as essential customers. The area supervisor is provided a list of these customers in his area, and service is restored as quickly as possible. Only designated representatives of the general manager can authorize preferential handling of other customers.

Information Center . . . To provide management with information necessary to direct such a large operation, it is essential that a central control for all phases of the operation be established. This is the information center.

Its function is to collect and display on master maps all reports of damage, to determine crew and material requirements, judiciously allocate crews to the respective areas, maintain current information on all primary lines energized, provide accurate estimates of the situation for release to the public, and, in general, guide all phases of the restoration program.

In the information center, large map boards are permanently installed and are revised once a year by pasting up prints of the regular primary maps and transmission diagrams. Provisions are made for plugging in additional telephones to lines not connected to the company switchboard. Jacks also are permanently installed for remote operation of two-way radio equipment.

Direct telephone lines to each of the telephone company's test boards are used to coordinate work requiring joint crews. There are large status boards to show the number of outstanding work orders in each area and amount of work accomplished each day. The necessary file folders and other special equipment are permanently stored there.

Five Groups . . . To decentralize operations in the Miami information center, the 25 storm areas are divided into five groups. There is a group supervisor, a group commercial representative, and a group clerk working as a team for each of the five groups. These people work in the information center and handle all matters, except map posting, relating to the areas under their jurisdiction. The group supervisor coordinates interchange of power between his areas where such is possible by feeder ties that can be cleared and energized quickly. The group commercial representative keeps in touch with needs of the community through his area commercial representative and advises the group supervisor accordingly.

Thirty-minute messenger service brings damage information to the information center in the form of duplicate copies of clearing orders and work orders. These are tallied, reviewed by the group supervisor, and the damage indicated on the map by color coded magnets. Reports on lines energized are telephoned or radioed in by the areas direct to map board operators.

Crew Allocation . . . Allocation of crews by quantity to each group is made from the information center by the superintendent of restoration based on the relative requirements. Each group supervisor, in turn, allocates his share of available crews to his various areas and so advises a group crew dispatcher. Assignment of crews is done by the crew dispatcher at the yard from which the crew operates.

In the information center, a group of commercial men is assigned to follow restoration of essential customers and shopping centers to maintain current status of industrial and large commercial customers and to supply information concerning either the general restoration picture or the status of a particular situation.

Customer Calls . . . A battery of 36 plug-in telephones in the service center handles calls from customers. This operation is separate from the information center. After the major portion of the primary lines in an area has been energized, trouble reported by the customer is forwarded to the area involved. A duplicate form is placed in a street address file so that repeat calls from the same address can be screened before sending to the area.

Restoration of transmission lines is directed from the information center based on reports of damage from patrolmen preassigned to the various sections of line. Company or rental aircraft are used for getting a quick general picture of damage to the transmission system.

Other Assignments . . . There are many other storm assignments that are vital to smooth operation. These include: arranging for shipments of dry ice, renting the large number of additional vehicles required, assisting customers in getting their stand-by plants in operation, arranging for out-of-town and foreign crews, preparing releases to press and radio, establishing a messenger service, getting required material rolling and emergency storerooms established, and arranging for food and housing.

Individual and team training are considered a necessity. Storm training is normally given priority over other work during the training period. In the late spring each man assigned to the storm organization without previous experience or training in his assignment attends one four-hour class per week for about six weeks. He receives basic training for his assignment during this period.

Following this, each area supervisor holds a four-hour practice meeting in his area once every two weeks. After about seven or eight weeks of this, a full-scale "dry run" is held on a Saturday in which all members of the storm organization, except the crews, take part.

California utilities combine to explore effects of cold weather on systems with electric space heating load. Most important conclusion is that degree-hour is more effective measuring unit than degree-day. Difference in heating pattern between weekdays and weekends is revealed by study on . . .

How Temperature Affects Load

EDWIN FLEISCHMANN, Consulting Engineer, San Francisco, Calif.

A study of the impact of temperature variation on system load by a group of major California utilities, definitely establishes that:

1. The proper measure of temperature effect for analyzing electric space heating is the degree-hour, rather than the degree-day.

2. The degree-hour deficiency below 70 F when the outdoor temperature is 65 F or less has proved a satisfactory unit, and good linear correlation exists between this unit and system load.

3. Greatly improved correlation results when data are divided into two groups: weekdays, and weekends and holidays.

4. Hourly slopes and correlations provide interesting figures for operating purposes as well as for rate design. While the computations are laborious, they can be simplified by punched card methods.

5. Hourly temperature-affected loads can be obtained for actual or normal years. Temperature-adjustment of revenues and expenses can be based on these figures.

Choose Overall Approach . . . The need for basic data on electric space heating has been pointed out time and again (EW, Nov. 2, 1953, p 80). But for this study it was decided that the overall approach would yield the most usable results. Efforts were made to

Based on a study by the author for a special committee under the chairmanship of O. R. Doerr, vice president in charge of sales, Pacific Gas & Electric Co, San Francisco, Calif.

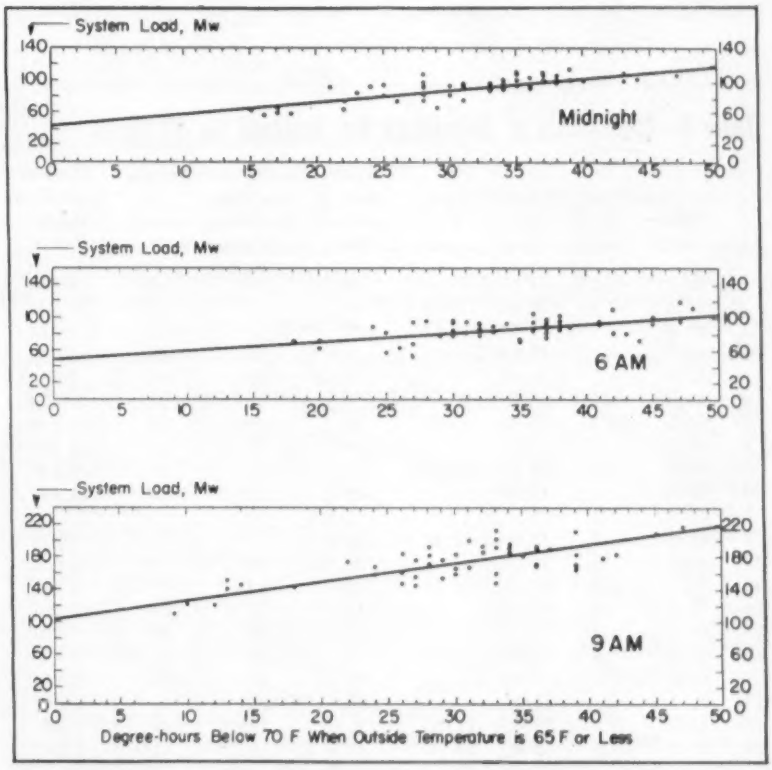


FIG 1—BETTER CORRELATION between loads and temperatures is found to exist when each hour of day during test period is taken separately. Data above are for weekends and holidays

Table I—How Temperature and Demand Correlate

Time	Kw increase in demand for 1-deg temperature drop (slope of line)	Non-temperature-affected load, kw (Intercept)	Coefficient of correlation, percent
Midnight	1,516	45,000	77.28
6 AM	1,114	51,000	61.32
9 AM	2,254	104,000	75.71

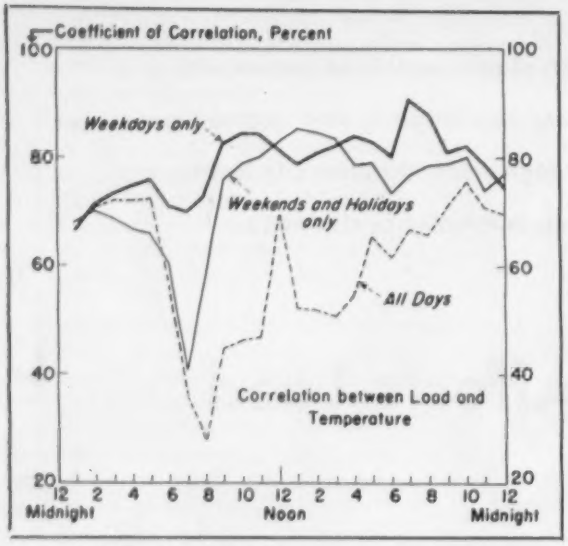


FIG 2—DEGREE OF CORRELATION is improved when weekdays are considered separately from weekends and holidays. On latter days impact of temperature-affected load is greater on total system load. Difference in timing of loads shows up in graph on the right

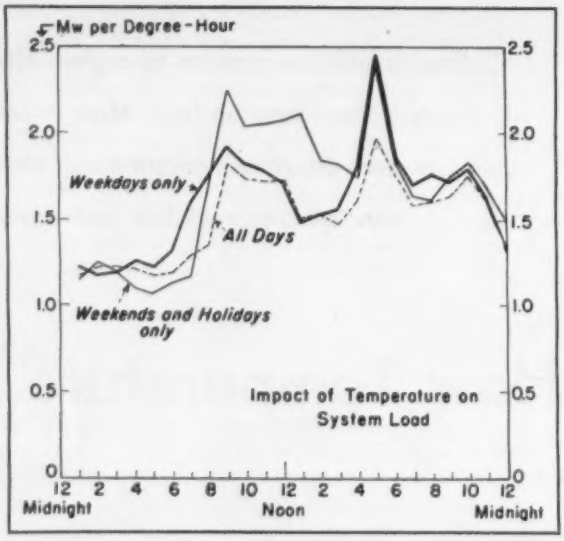


Table II—Coefficients of Correlation Are Analyzed for 32 Cases

Case	Coefficient of Correlation: Maximum	Minimum	Median	Average	Significant if greater than	Hours with less than significant percentage	Number of observations	Time of maximum correlation
1	89.6%	45.2%	77.65%	72.47%	60%	6	14	2 AM
2	86.1	31.4	80.10	72.58	46	3	22	10 PM
3	92.8	4.8	79.17	70.63	47	4	21	5 AM
4	61.9	7.2	43.80	39.26	27	6	57	6 PM
5	54.9	0.7	40.55	35.82	39	10	30	2 AM
6	44.0	8.2	30.80	29.60	38	20	31	4 AM
7	64.1	40.3	49.70	50.61	38	0	31	6 AM
8	57.5	....	21.80	.....	39	19	29	5 AM
9	84.4	1.4	49.45	48.99	38	3	31	5 AM
10	76.6	....	12.90	.....	39	20	29	5 AM
11	61.0	33.3	42.00	41.43	38	7	31	7 AM
12	56.1	....	20.30	.....	39	18	29	5 AM
13	77.9	8.9	30.15	38.10	38	13	31	2 AM
14	71.0	....	15.00	.....	45	20	23	12 AM
15	62.3	....	.....	.....	39	21	31	7 AM
16	73.5	32.9	49.95	51.91	49	11	20	12 AM
17	22.8	....	7.35	.....	38	24	31	2 AM
18	21.2	....	10.40	.....	38	24	31	7 PM
19	45.2	8.2	26.60	27.72	38	16	31	7 AM
20	64.1	8.3	32.35	34.95	38	15	31	8 PM
21	24.1	3.5	17.15	16.43	39	24	30	1 AM
22	43.5	12.5	19.15	20.27	38	23	31	7 AM
23	35.7	17.8	27.25	27.41	38	24	31	10 PM
24	91.0	26.4	62.40	61.39	38	2	31	4 AM
25	30.7	....	12.60	.....	38	24	31	3 AM
26	58.7	....	20.60	.....	38	18	31	5 AM
27	41.7	....	20.50	.....	39	23	29	7 PM
28	78.1	....	31.10	.....	39	15	29	1 PM
29	65.4	....	13.05	.....	38	18	31	2 PM
30	84.7	23.6	51.10	52.05	40	5	28	4 PM
31	54.8	....	33.25	.....	41	18	27	9 PM
32	74.7	....	24.10	.....	34	17	37	5 AM

obtain from various parts of the country a maximum of information covering loads of major segments of utility systems and temperatures at nearby weather stations.

Extensive examination of the literature on electric space heating revealed little or no relationship between the load imposed by falling temperatures and the degree-day deficiency (so-called degree-days) in the area. This unit has been used in the gas and fuel oil and the steam heating industries to relate heating costs between localities.

In those utilities, the quantity of fuel used per day is the unit, and the peak demand is a peak-day demand. In the electric industry, however, the peak demand is hourly or half-hourly.

It was evident that the proper unit for measuring the impact of temperature on electric systems was the degree-hour deficiency. Moreover, the 65 F base appeared somewhat low. Theoretically, heat generally is not applied until the temperature drops below 65 F, when the usual attempt is to heat buildings to 70 F. This study confirmed that very close correlation of electric use and temperature should be obtained by utilizing the degree-hour deficiency below 70 F when the outdoor temperature is 65 F or less.

Consider Each Hour Separately . . . While the use of hourly loads and hourly temperatures improved the relationship, better correlation resulted when each hour of the day was con-

sidered separately. Customers' activities vary throughout the day, and their heat needs vary accordingly.

The study disclosed that a plot of hourly load and the degree-hour deficiency at the same hour produces points falling quite close to a straight line. The complete story is obtained by plotting a chart for each hour of the day. Three hourly charts showing the very high correlation obtained are illustrated in Fig 1.

Punched Card Methods . . . Of the information supplied by 24 utilities throughout the country, only data from 19 were usable. Hourly temperature and load data for at least 30 days were necessary. Analysis of this mass of information was simplified greatly by the use of punched card methods. First-degree, least-squares calculations appeared to give good results when the hourly data for all days were used together.

From the computations three quantities were produced for each hour of the day:

1. The slope of the line, which measures the impact of the temperature-affected load on the system in kw per degree-hour at that hour.

2. The intercept of the line on the vertical axis which gives an approximation of the non-temperature-affected load.

3. The coefficient of correlation, which indicates the closeness of the points to the line.

For each of the three hours in Table I, the impact of temperature-affected load, the non-temperature affected load, and the coefficient of correlation are different.

It is important to judge the validity of the results of this study. Judgment must rest largely upon the coefficients of correlation. If these are below the statistical minimum, they are not significant; and conclusions cannot properly be based on them. Table II summarizes the important values in 32 cases for which computations were completed.

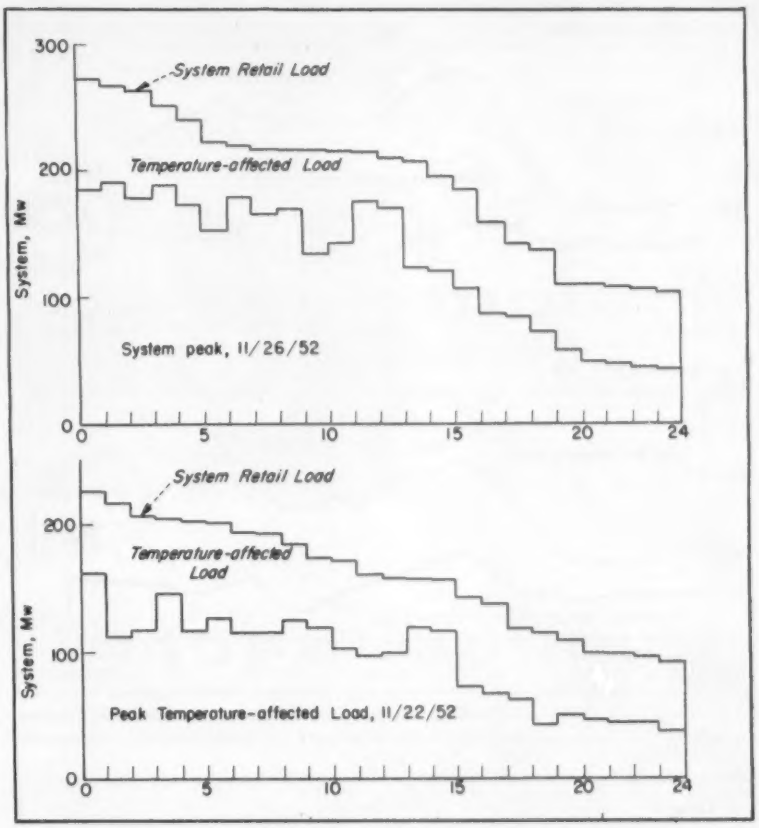


FIG 3—ESTIMATED TEMPERATURE-AFFECTED LOAD may be based on the correlation between hourly load and the degree-hour deficiency. Data cover midnight-to-midnight

Table III—Peaks and Peak Hours and Temperature-Affected Load

Item	
1 System peak (11/26/52 at 9 AM)[1]	270,780kw
2 TAL[2] on system peak	84,478kw
3 Maximum TAL (11/22/52 at 9 AM)	105,938kw
4 Highest 6 PM TAL (11/27/52)	74,334kw
TAL on system peak as a percentage of	
5 System peak (2 ÷ 1)	31.20%
6 Maximum TAL (2 ÷ 3)	79.74%
7 Highest 6 PM TAL as a percentage of maximum TAL (4 ÷ 3)	70.17%
8 Annual load factor of TAL	23.0%[3]

[1] For 12 months ending 3/31/53.
[2] Temperature-affected load.
[3] Excluding TAL which the method applied to actual temperatures developed in certain night hours during June, July, and August.

Variations Distort . . . Data supplied for Case 4 covered hourly records of system total retail load and hourly temperatures on 57 days in February and March. While good correlation existed during most of the hours, certain variations distorted the picture. These were thought to be caused by the fact that some of the load affected by temperature came on somewhat after the temperature dropped. But analysis showed this was not the case.

Another explanation of the variation in degree of correlation was the possibility that early morning start-up of heavy industrial load and other large load swings suppressed the impact of temperature. Using other data from the same utility, it was shown conclusively that hour-by-hour correlations were greatly improved when weekdays were considered separately from weekends and holidays. The upper block of Fig 2 shows this.

In the lower block the difference in timing of the temperature-affected load on weekdays and weekends is evident. That portion of the load comes on more severely but later during weekends and holidays. Magni-

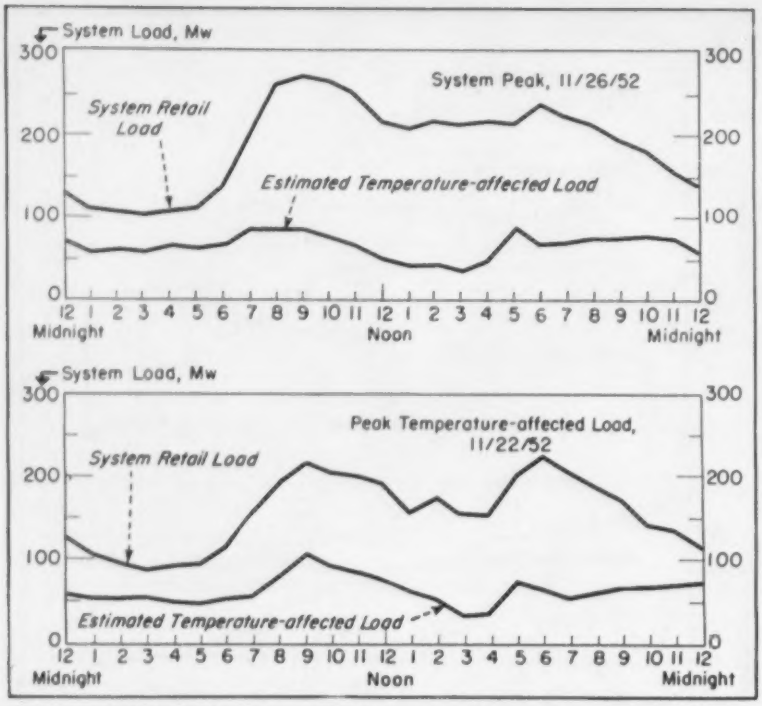

System Load, Mw
300
200
100
0
System Peak, 11/26/52
System Retail Load
Estimated Temperature-affected Load
12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12
Midnight
Noon
Midnight
System Load, Mw
Peak Temperature-affected Load, 11/22/52
System Retail Load
Estimated Temperature-affected Load
12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12
Midnight
Noon
Midnight

FIG 4—TWO PEAK DAYS as reflected in the load-duration curves above show the duration and the impact of the temperature-affected load on system's load during November temperatures

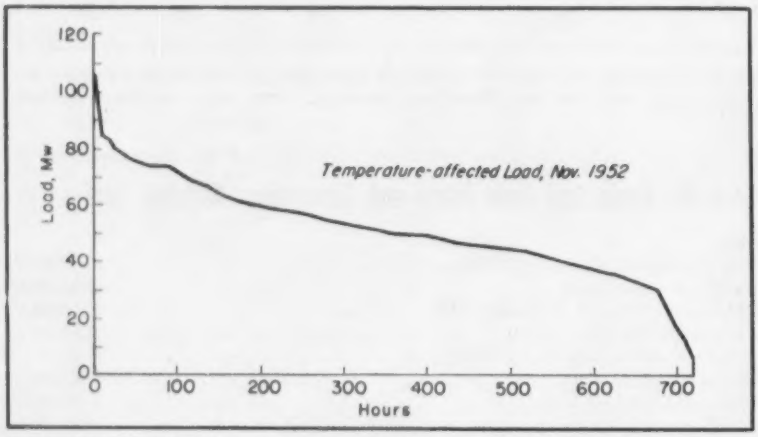


FIG 5—LOAD DURATION curve can be an important and useful tool in system design and operation. Especially noteworthy in the above curve is the short duration of the system peak

Table IV—Degree-hour Deficiency Is a More Accurate Unit

	Average temperature, F*	Degree-hour deficiency below				Estimated temperature affected-load, kwhr	
		65 F		70 F			
		Amount	Index	Amount	Index	Amount	Index
Tuesday, Jan. 2.	49	331	100	451	100	709	100
Monday, Jan. 15.	49	401	121	521	116	835	118
Sunday, Jan. 28.	49	429	130	549	122	892	126

* Computed by the weather bureau as the average of the maximum and minimum for the day.
Degree-days for each day was 16.

tude of the afternoon peak impact, is alike weekdays and weekends.

Data one year apart were calculated to determine the growth of the temperature-affected load on the system. It was observed that the coefficient of correlation is poor each year early in the morning. But in all cases, it was well above the lower limit of significance. Furthermore, the growth of the non-temperature-affected load each hour was obtained by comparing the intercepts of the hourly curves for the two years.

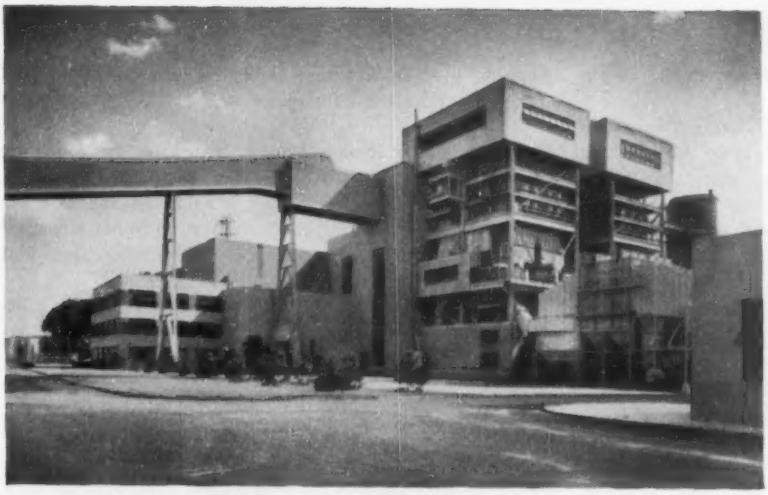
Provides Powerful Tool . . . The correlation between hourly load and degree-hour deficiency affords utilities a powerful tool. It enables them to estimate their temperature-affected load. With the use of appropriate unit cost figures, they can make suitable provision in their rates for serving it.

In obtaining the hourly temperature-affected loads, it is possible to plot that load each hour. System retail load of the Case 4 utility on the system peak day (Nov. 26, 1952) and the estimated temperature-affected load on the same day are illustrated in Fig. 3. Also shown are the system load and the estimated temperature-affected load when the latter was at a maximum (Nov. 22, 1952).

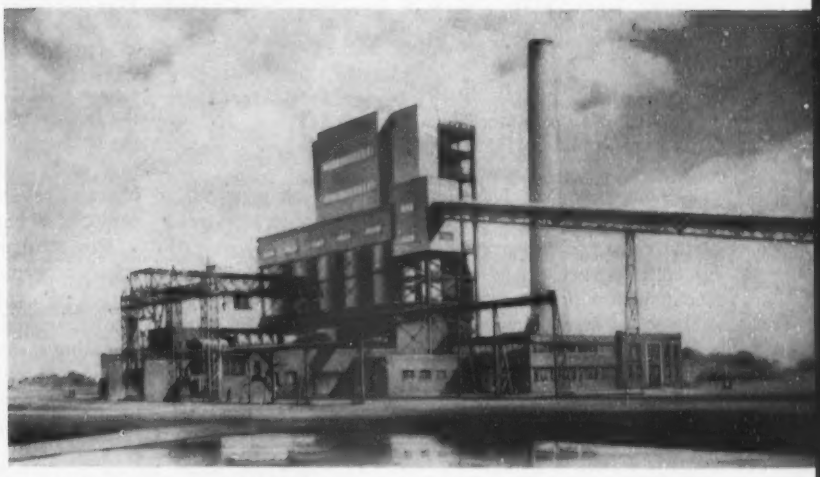
Some relationships of value in studying the cost of serving electric space heating may be obtained from such an analysis. As summarized in Table III, the temperature-affected load contributed 31% of the load at system peak time. But less than 80% of the maximum temperature-affected load was on then. Assuming that most temperature-affected load is residential and that the residential peak is at 6 PM, the data show the highest temperature-affected load at that hour was only 70% of the maximum yearly system temperature-affected load. The computed annual load factor of 23% for the estimated temperature-affected load is close to those found throughout electric space heating literature.

Some idea of diversities between the temperature-affected load peak and the system peak may be gained from the percentages in Table III. No data are available to show the nature of the heating load on this system, although most of it is probably residential. When this can be established, the intra-class diversity between heating and other residential uses can be approximated.

(*Continued on page* 169)



From Port Jefferson in 1948 . . .



To Barrett in 1956 . . .

Long Island Plants Reflect Design Progress

In the nine postwar years ending in 1956, Long Island Lighting Co will have added 610 Mw of generating capacity to its system. Six large units in four stations are involved in the program.

Five factors have dominated the company's station design during this period:

WILLIAM WELCH JR.,
Assistant Vice President and Engineering Manager,
Long Island Lighting Co

1. Rapid rate of load growth.
2. High fuel, labor, and construction costs.
3. Moderate climate.
4. Limitation of available plant sites.
5. Proximity of suitable sites to residential areas.

The influence of these factors is evident in the design evolution of these plants.

The rapid rate of load growth, the attendant financing problems, and high construction cost have dictated the use of large units, thereby securing the advantage of low unit cost. The last four units, involving installation of 500 Mw of capacity, will consist of three 110-Mw units and one 170-Mw unit.

Because of a competitive fuel situation the stations are equipped for multiple fuel use. Relatively high fuel cost has led to the use of the reheat cycle and high steam temperatures and pressures. Automatic controls and instrumentation have been used extensively in order to secure the most efficient use of operating labor. High construction cost has favored the economics of large unit systems.

Moderate climate allowed the use of the outdoor type of construction. This, together with the use of the unit system, permitted simplified and compact arrangements. Because of the limitations of sites it became necessary to develop those available to the fullest extent consistent with costs. Proximity to residential areas has led to considerable landscaping, choice of low noise level transformers, high stacks, high efficiency dust collectors, and pleasing architectural treatment.

Development of Design Philosophy . . . The following paragraphs describe how this design philosophy has been incorporated in the actual construction of the postwar plants. They also describe the changes in philosophy that have taken place as successive plants were constructed and why these changes were adopted.

Perhaps the outstanding characteristic of these postwar plants is the definite trend to the outdoor type of construction. This has so far resulted in a saving of $4 per kw of capacity. Equally significant has been the endorsement of the plants by the operators. They favor the greater physical comfort made possible by the outdoor design. Freezing temperatures, snow, ice, and rain have not affected operations although there was some anxiety that they might.

The company has been a pioneer in fostering this type of construction in the Northeast. Semi-outdoor boilers were used by the company for the first time in the 1948 Port Jefferson installation.

Port Jefferson Plant, 1948

The two-unit Port Jefferson plant, built on a new site in the eastern part of the territory, incorporates most of the characteristics previously mentioned. The front of the boiler is enclosed by an extension of the bunker, coal feeder, and millroom bay. The drum level is completely enclosed by Transite panels bolted to the boiler steel framing. This enclosure provides protection for drum level gauge glasses and at the same time forms an enclosed head for the two stairways which extend to the drum level. Enclosures of similar construction are provided at the burner level. Brick walls at the ground level enclose the bottom furnace area and the forced-draft fans. Breeching, boiler casings, air preheaters, dust collectors, soot blowers, and induced draft fans are exposed. Boilers are equipped to burn either coal, oil, or both.

This construction has been satisfactory except for some minor problems involving better protection against freezing of air and water lines and soot blower air motors. The problems were solved locally. The soot blower operating mechanisms and fan control cylinders were enclosed and provided with space heaters. Air and water lines were bundled and insulated with electric resistance wire heaters or steam tracers.

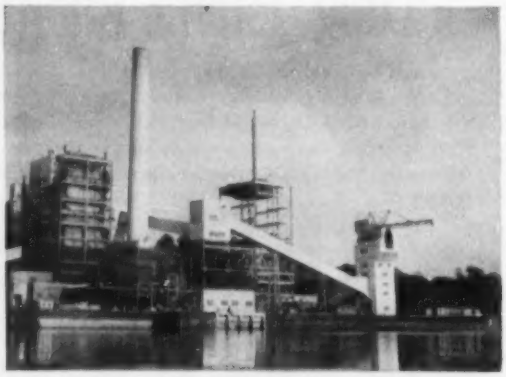
Glenwood and Far Rockaway Plants, 1952 to 1954

A further step toward outdoor construction took place with the design of three 110-Mw units. The first unit went into operation at Glenwood in 1952, the second at Far Rockaway in 1953, and the third is scheduled for Glenwood in 1954.

Outdoor Design . . . Fewer weather-protecting structures were used for the boilers of these units. In addition, all turbine room structures above the turbine deck level were completely eliminated.

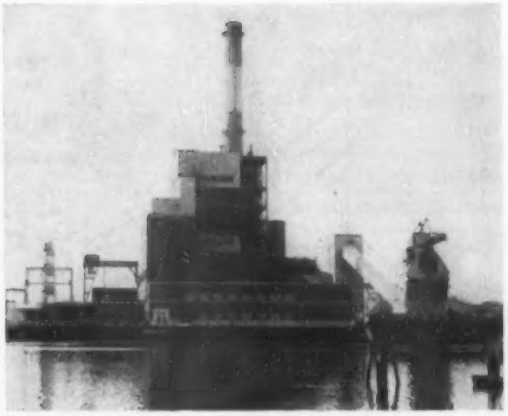
At Glenwood the new two-unit plant was built at the southerly end of an existing power station site. It is, however, a completely new plant with independent facilities.

Far Rockaway was designed from the Glenwood drawings as a two-unit plant, but only one unit has been constructed. While it is on an existing station site, it also is an entirely new plant.



GLENWOOD'S OUTDOOR BOILERS. The No. 1 unit is shown on the left and the No. 2 unit, still under construction, on the right

GLENWOOD TURBINE-GENERATORS are outdoors. A centralized control room is located on turbine deck between the two 110-Mw units



FAR ROCKAWAY STATION is a duplicate design of the Glenwood Station except that only one 110-Mw unit has been installed

Outdoor Boiler and Turbine . . . This description of Glenwood applies equally as well to Far Rockaway with the exception that only one unit has been installed at the latter site. Here again the boiler faces the enclosed bunker, coal feeder, and pulverizer bay. This enclosed vertical space provides protected stairwells and work spaces in this area. The boiler is roofed with concrete. Drum and burner levels have Transite panel enclosures. All other boiler parts are exposed.

Elimination of the building structure above the turbine deck is new in this area. The turbine and generators are weatherproof. Steel walk-in enclosures are used over the exciters and head ends. A brick deck house, between the head ends of the opposite hand turbine units, contains the centralized controls for the two units. The space below the turbine deck is fully enclosed and houses condensers, heaters, evaporators, pumps, and associated equipment. The switchgear and load centers are located indoors since it is felt that maintenance during inclement weather would be difficult if this equipment were completely outdoors.

During erection of the units a portable enclosure was used to protect the turbine and generator during inclement weather. This enclosure has a tubular frame, aluminum roof, and canvas side curtains. It will be available in the future for maintenance work on any of these units.

Frost-Proofing Minimized . . . Because of the plant layout only major equipment is exposed to the weather. The majority of the auxiliary equipment is fully housed. Likewise, most small piping, except for local connections to exposed units, is run in a protected space. In this manner most of the possible savings of outdoor construction have been secured without the cost and inconvenience of frost-proofing large quantities of small piping and individual units.

Another rewarding feature of this type of construction is that the central coal bunker and mill room act as an effective sound barrier between the two groups of major noise-making equipment, namely the turbine, generator, and transformers on one side and the fans on the other. The two units now in operation have proved to be surprisingly free from objectionable noise. The boiler feed pumps and their auxiliaries are located indoors below grade and consequently do not contribute to the noise problems.

Edward F. Barrett Plant, 1956

Construction has just started on the initial unit of this station. The first unit will be rated 125/156 Mw. It is expected to have a capability of about 170 Mw. It will have a single boiler, single-shaft turbine-generator unit, and a single power transformer. The heat cycle will use steam of 1,850 psig at 1,000 F initial temperature and 1,000 F reheat.

More Outdoor Design . . . This station is also the outdoor type. However, operating experience at the plants in operation showed that additional equipment could be placed outdoors. Therefore the same general design principles used at Glenwood and Far Rockaway will be used, but no enclosures will be used for the coal silo and coal elevator. The boiler burner elevations will also not be enclosed.

The initial Barrett installation will burn coal, but provisions have been made to add oil facilities should economics so warrant.

The success of the outdoor plants has led to the conclusion that the effort spent on their design was worth it. Since the end of World War II the company has carried on an extensive expansion program which required nearly $200 million for electric facilities alone. Savings brought about reduced station construction costs, though but a small percentage of the whole, were definitely helpful.

Incremental Loss Reduction With Secondary Capacitor

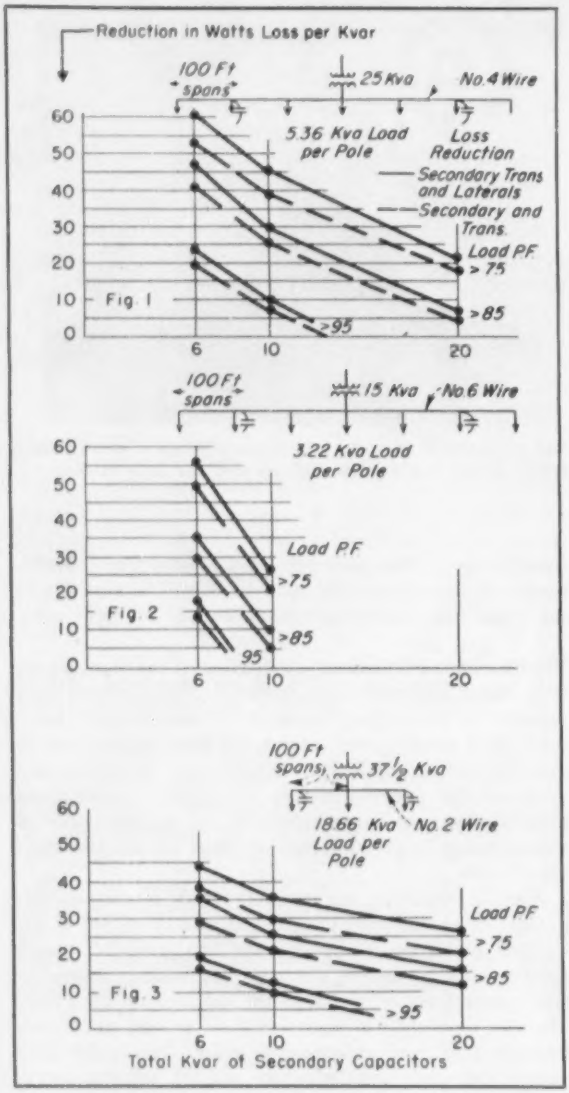


FIG 1, 2 & 3—REDUCTION OF LOSSES in secondary, transformers and laterals for specific pattern and density of primary distribution

Panel I—Formula determines minimum watts loss necessary to justify secondary capacitors

$$A = \frac{B}{C} = \frac{\text{addit'l annual cost per sec cap kvar}}{\text{annual value per watt reduction}}$$

$$B = [(\text{sec cap cost/kvar}) - (\text{pri cap cost/kvar})] \left[\frac{\%\ \text{annual capitalization}}{100}\right]$$

$$C = [(0.001\ \text{kw})\ (\text{hrs/year})\ (\text{equiv hrs})\ (\$\ \text{energy cost})] + \left[(0.001\ \text{kw})\ (\$\text{-value of system Kw})\ \frac{(\%\ \text{ann capitalization})}{100}\right]$$

Substituting the values in this comparison,
A = 27.3 w reduction/kvar for 3-kvar unit
A = 24.6 w reduction/kvar for 5-kvar unit

J. J. HEAGERTY, N. M. NEAGLE, General Electric Co, Schenectady, N. Y.

Chief economic justification for using residential secondary capacitors lies in the resulting reduction of losses in the primary feeder laterals, distribution transformers, and secondaries. Secondary capacitors also offer increased area coverage of voltage-limited circuits, reduced voltage spread, and released thermal capacity in distribution transformers.

Voltage improvement is practically at the consumer's service. This voltage benefit in itself is frequently enough to justify using secondary capacitors.

Larger distribution transformers, lower power factors, longer secondaries, and smaller wire sizes are conditions favoring the application of secondary capacitors.

Both a 3 and 5-kvar unit are available. The 5-kvar capacitor costs less per kvar, has lower installation cost per kvar, and involves less pole congestion.

In general, based on loss reduction, two 3-kvar units on each distribution transformer whose load power factor is less than 0.9 or two 5-kvar units on each 25-kva-or-larger distribution transformer whose load power factor is less than 0.85 can be economically applied. With regard to increased area coverage of voltage-limited circuits, for the cases investigated, the secondary capacitors showed worthwhile savings. Greatest voltage benefits are gained by using the capacitors only on the distribution transformers farthest from the substation (feedpoint).

The residential secondary capacitors being nearer the load provide additional benefits above those obtainable by primary capacitors. To justify economically the secondary capacitor's higher cost per kvar, the dollar value of the additional benefits should exceed the difference in cost between the secondary capacitors and the primary capacitors. This method of evaluation assumes that fixed primary capacitors are already justified.

The following approaches were investigated:

1. Loss reduction in laterals, distribution transformers, and their secondaries.
2. Increased load area coverage.
3. Voltage improvement.
4. Released thermal capacity in distribution transformers.

Loss Reduction . . . The additional loss reduction benefits obtained by secondary capacitors occur in the primary laterals, distribution transformers, and secondaries. This assumes that the primary capacitors are so placed on the mains that the losses in the mains are the same whether primary or secondary capacitors are considered. If the primary capacitors are considered to be located at the feedpoint, then loss reductions in the mains can also be credited to the secondary capacitors.

The method used in evaluating the benefits of residential secondary capacitors in reducing losses is: (1) determine the watt loss reduction at time of peak load per kvar of residential secondary capacitors, and (2) determine the loss reduction needed to justify the added cost of the secondary capacitor. This method determines the maxi-

Secondary Capacitor Economics

mum kilovars of residential secondary capacitors that can be applied which will pay their own way.

Figs 1, 2, and 3 show watt loss reduction per increment of capacitor kvar, based on an analysis of three secondary distribution circuits. At peak load, the transformers are assumed to be carrying 150% of rating. Reduction of losses in the laterals is included for a specific pattern and density of primary distribution. In establishing this loss reduction, the following conditions were assumed:

1. A primary distribution pattern of 4.16-kv circuits as shown in Fig 4.

2. Customer load density of 4,550 kva per sq mi.

3. With no capacitors used, the voltage drop from the first to the last distribution transformer is 4%.

4. Mains of No. 2/0 and laterals of No. 4 wire.

5. Distributed non-diversified load consisting of 15, 25, or 37.5-kva transformers carrying 1.5 times rated load at peak.

The curves cited indicate that the loss reduction in the laterals is a significant part of total savings. Approximately the same amount of loss reduction could be realized in the mains as is realized in the laterals if the primary capacitors were considered to be located at the primary feedpoint.

To determine if and to what extent residential secondary capacitors are economical, the minimum watts loss per kvar to justify their application must be determined. The equation for this calculation is in Panel I. To illustrate the use of this equation, the following factors have been assumed:

1. Secondary capacitor installed cost per kvar is $17 for 3-kvar units. Secondary capacitor installed cost per kvar is $16 for 5 kvar units.

2. Primary capacitor installed cost per kvar is $7.

3. Annual capitalization is 15%.

4. Annual kilovar equivalent hours are (0.20)x(8,760) = 1,752.

5. Energy cost is 1¢ per kwhr.

6. System capacity value is $250 per kw.

The minimum watt loss reduction justifying secondary capacitors is 27.3 w per kvar for 3-kvar units; 24.6 w per kvar for 5-kvar units. Of items 5 and 6 above, the latter is the more important cost. Changing the energy charge from 1¢ to ½¢ per kwhr increases the watt loss reduction needed to justify the 3-kvar secondary capacitors from 27.3 to only 32.4.

Capacitors on the secondary are economical as long as the watt loss reduction per increment of additional kvar is not below 27.3 w per kvar for 3-kvar units, or not below 24.6 w per kvar for 5-kvar units. When the peak load power factor on the secondary circuit in Fig 1 is assumed to be 0.85 and the curve at 24.6 w is traced over to the 0.85-pf line, two 5-kvar secondary capacitors can be seen to be justified.

The loss reduction indicated by the dashed line in Figs 1 and 2 is divided about equally between the transformer and transformer secondary, emphasizing the importance of locating the capacitor out on the secondary, away from the transformer. In Fig 3, the loss reductions are about ⅓ in the secondary and ⅔ in the transformer.

This method of evaluation is a conservative approach, as the I^2X loss reduction (which is about equal to the I^2R loss reduction) and the voltage improvement resulting from the capacitor application, have not been evaluated.

Panel II—Method for evaluating larger area coverage offered by secondary capacitors (grid feed):

$$\text{Voltage drop in } \% = \frac{D\,(Z_1 a^3 + 3.15 Z_2 d a^2)}{15\ kv^2}$$

where D = density in kva/sq mi

a { = distance from feed point to end of main
  = distance from end of main to end of lateral

Z_1 = (R cos θ + X sin θ) for main in ohms/mi

Z_2 = (R cos θ + X sin θ) for laterals in ohms/mi

d = distance between laterals in miles

kv = line-to-line voltage

Example: It is assumed that all transformers are 37.5 kv loaded to 1.5 times rating at peak, with two 5-kvar secondary capacitors on each secondary. Before capacitors are applied, load density is 4,550 kva/sq mi, pf is 0.85, and % VD is 4%.

$$\text{New density} = \frac{\text{original pf}}{\text{new pf}}\ (\text{original density}) = \frac{0.85}{0.925}\ (4{,}550)$$

$$= 4{,}190\ \text{kva/sq mi}$$

Z_1 @ 0.925 pf = 0.665 ohms/mi

Z_2 @ 0.925 pf = 1.505 ohms/mi

d = 0.1135 mi

kv = 4.16 kv

Voltage rise in secondary caused by capacitors is 0.46% per Fig. 5.

Total allowed voltage drop in primary 4% + 0.46% = 4.46%

$$Z_1 a^3 + 3.15\, Z_2\, d a^2 = \frac{15\ kv^2\ \%\ VD}{D}$$

$$a = 0.552\ \text{mi}$$

Then the area served with secondary capacitors,

$$A_1 = 4a^2 = 1.22\ \text{sq mi}$$

Total capacitance added is 850 kvar.

If primary capacitors are used instead of secondary, 850 kvar is used on mains at a distance of 0.501 miles from the feed point. Before capacitors are applied, load density is 4,550 kva/sq mi; pf is 0.85, % VD is 4%.

$$Z_1 a^3 + 3.15\, Z_2\, d a^2 = \frac{15\ kv^2}{D}\left[\%\ VD + \frac{kvar\ X}{10\ kv^2}\right]$$

Z_1 @ 0.85 pf = 0.73 ohms/mi

Z_2 @ 0.85 pf = 1.515 ohms/mi

d = 0.1135 mi

kv = 4.16 kv

kvar = 3-phase kvar

X = Reactance of mains from feedpoint to capacitors = 0.343 ohms

$$a = 0.521\ \text{mi}$$

The area served with primary capacitors, A_2 = 1.088 sq mi.

If a large area is considered to be made up of unit areas which have either primary or secondary capacitors, it will take fewer of the unit areas with secondary capacitors. Evaluating the cost of serving a large area will show the relative economics of using the two types of capacitors.

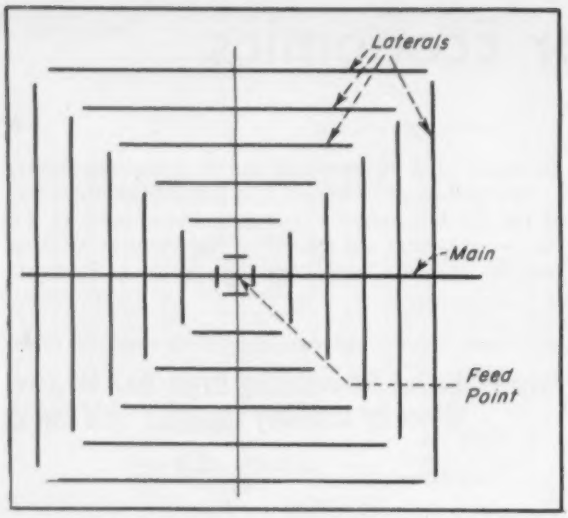


FIG 4—THE GRID METHOD of area feed has been used throughout the exposition of system economics of employing residential capacitors

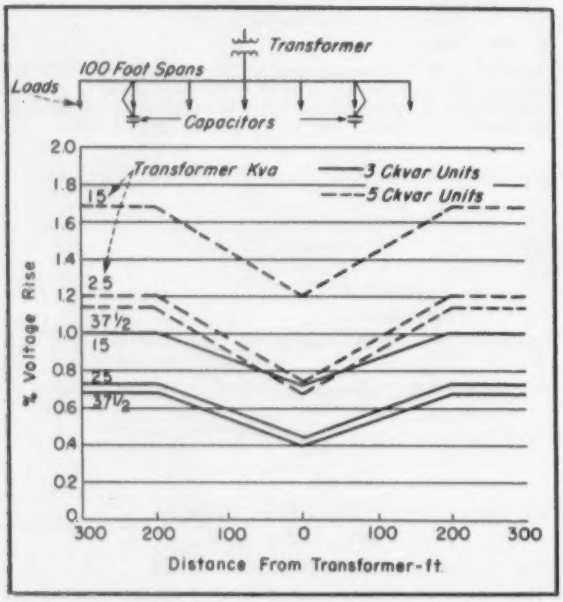


FIG 5—PERCENT VOLTAGE RISE in distribution transformers and secondary caused by secondary capacitors on either side of unit

Panel III—Results obtained from application of formula in Panel II.

Distribution Transformer Size-Kva	Kvar per Transformer	Additional Annual Estimated Savings per Secondary Kvar
37.5	2—3's	$2.42
37.5	2—5's	1.75
25	2—3's	2.45
25	2—5's	1.34
15	2—3's	1.17

Area Coverage . . . For increasing area coverage, secondary capacitors on every secondary or primary capacitors near the ends of mains have been compared under the following conditions:

1. A primary distribution pattern of 4.16-kv circuits as shown in Fig 4.

2. Customer load density of 4,550 kva per sq mi.

3. Customer load power factor of 0.85.

4. Distribution transformers all 37.5, 25, or 15 kva, loaded to 150% of rating at peak.

5. Two 3-kvar or two 5-kvar secondary capacitors connected to each secondary as shown in Fig 1. An amount of primary capacitor kvar equal to the total secondary capacitor kvar, connected near the ends of the mains.

6. With no capacitors used, the voltage drop from the first to the last distribution transformer is 4%.

7. Mains of No. 2/0 and laterals of No. 4 wire.

The method used is shown in Panel II, and the results are shown in Panel III.

The two items that aided greatly in showing the savings with secondary capacitors were the reduction of losses and the voltage rise in the secondary. In using this voltage rise in the secondary to get increased area coverage, it is assumed that the first customer is served directly from the distribution transformer while the last customer is served from the end of the secondary circuit.

Voltage Improvement and Released Capacity . . . Residential secondary capacitors afford additional voltage benefits in two ways: First, there is a voltage rise in the distribution transformer and its secondary circuit; and second, the secondary capacitor produces some voltage rise on the single-phase laterals.

Greatest reduction in voltage spread on a primary feeder is realized with secondary capacitors used only on the transformers farthest from the feedpoint. Two 3-kvar units two spans out on the secondary of the last transformer (37.5 kva with No. 2 secondary wire) reduce the voltage spread between first and last customer on the feeder by 0.68% voltage.

This application has not had complete utility acceptance and has been used mainly in solving specific voltage complaints.

Fig 5 correlates the voltage rise per kvar of secondary capacitors situated on either side of the various size distribution transformers with the distance measured in feet of the capacitors on either side of the distribution transformers.

Secondary capacitors release capacity in the primary laterals, distribution transformers, and secondary feeders in addition to the capacity released by primary capacitors located on the mains. The capacity released in the distribution transformer is most important. However, secondary capacitors used for the single purpose of releasing transformer capacity cannot be economically justified because the incremental cost of going to the next larger transformer is too small.

Increased revenue from higher average voltage is another benefit to be gained. This means that some or all of the loss reductions made by the capacitors are being sold to consumers. Using the method of evaluating losses shown previously in this article, the economics of secondary capacitors should be essentially the same as if the net loss savings and the added sale of energy had been evaluated.

Graphic Meter Facilitates Commutator Brush Positioning

FRANK I. MORGAN, Pennsylvania Water & Power Co, Lancaster, Pa.

Use of a modified low-range graphic voltmeter and a special probe expedites recording of commutation voltages on dc machines. Pennsylvania Water & Power Co found that the two devices save considerable time and simplify the former laborious job of obtaining and recording voltages between commutator bars and between commutator and brushes.

The voltmeter is a 5-ma graphic ammeter with a series resistance of approximately 3,000 ohms. Zero position of the pen is moved to the center of the chart. Wires from the voltmeter are attached to two pencil leads equipped with springs and mounted in a suitable case of insulating material, Fig 1.

Moving the pencil leads in the probe along the commutator causes the graphic meter to draw the characteristic curve. When both pencil leads are pressed against the commutator, the average voltage between commutator bars is recorded, if the leads are correctly spaced. Voltage between the commutator and brush is recorded by using only one of the pencil leads, the other wire from the voltmeter is connected to the brush.

Center of the brush is easily located on the curve by manually marking the edge of the chart upon receipt of a signal from the man moving the probe. If desired, the leading and trailing edges of the brush can also be marked on the chart.

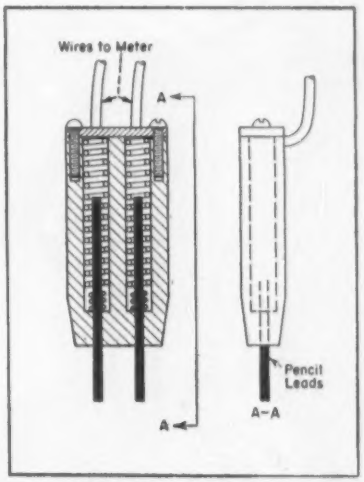


FIG 1—COMMUTATOR PROBE has two pencil leads that contact bars to pick up voltage

When recording voltages the speed of the paper should be approximately 12 to 18 in. per min. Care must be taken when obtaining the commutator-to-brush curves to avoid damaging the meter by excessive voltage.

Formerly, to obtain the data required for plotting the curves, a row of small holes spaced the width of a commutator bar apart were drilled in a thin strip of insulating material. The strip was then fastened near the brush arm in such a way that pencil leads inserted into the holes would bear on the commutator. Wires attached to the pencil leads were connected to an indicating voltmeter, the indications of which were read and recorded for plotting. This method was laborious and rather time consuming.

Commutation voltage curves for a 125-kw, 250-v exciter having a wave-wound armature and shunt and commutating poles were obtained with the graphic meter. Under conditions shown in Fig 2, commutation was very poor and there was severe sparking. Commutatior-to-brush voltage curve shows decided under-compensation, and the potential-between-bars curve shows that reversal of voltage in the coil undergoing commutation did not occur until after bars had passed under the brush.

(*Continued on page* 88)

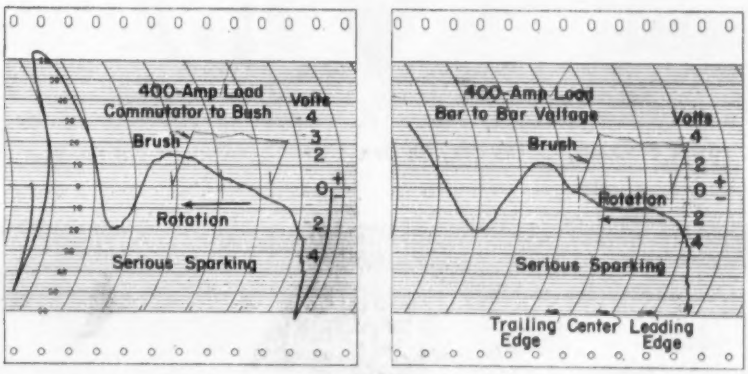


FIG 2—SEVERE SPARKING at the commutator of a 125-kw, 250-v exciter was eliminated with the aid of these charts made by a graphic voltmeter in conjunction with a special probe

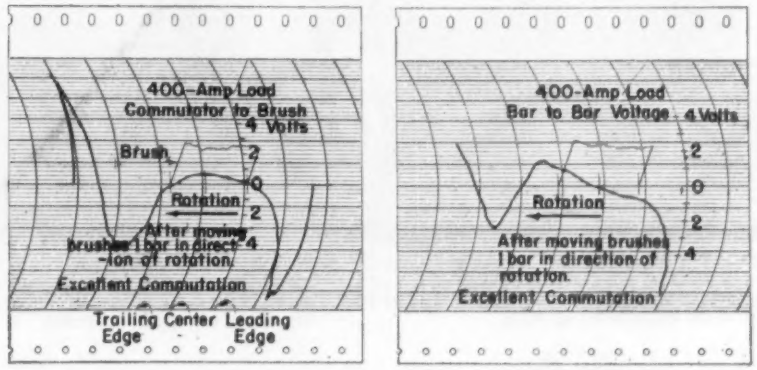
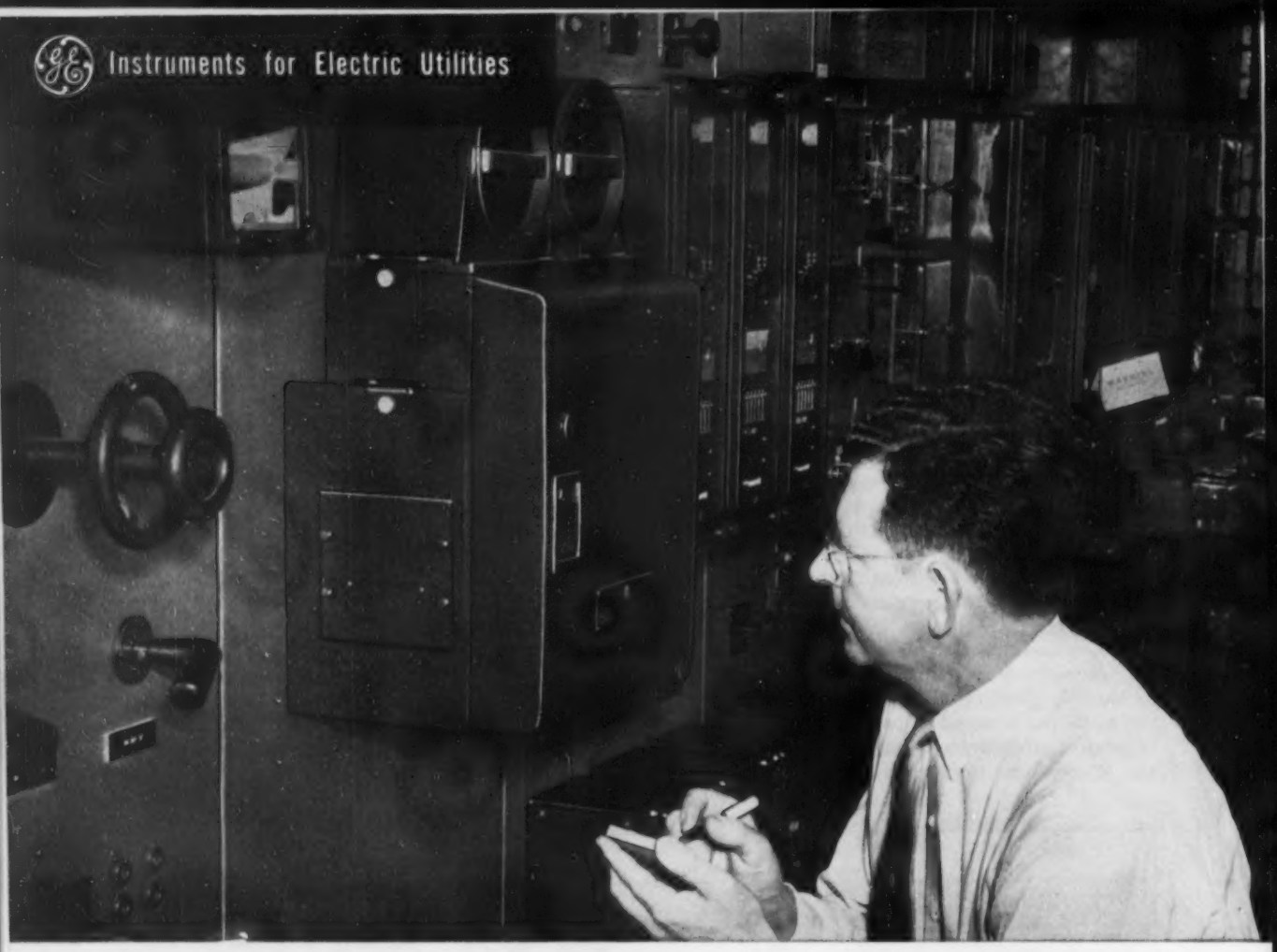


FIG 3—EXCELLENT COMMUTATION resulted when brushes were moved one bar in direction of rotation. Brush position was marked on bottom of chart when man moving probe signaled

Instruments for Electric Utilities



MR. C. F. WHATELY, APPALACHIAN ELECTRIC POWER COMPANY, CHECKS COUNTER OF G-E OSCILLOGRAPH FOR LINE-FAULT ACTION.

General Electric Type PM-18 Oscillograph is Low-cost, Versatile Recording Instrument

GENERAL-PURPOSE OSCILLOGRAPH

READILY PORTABLE, this instrument conveniently provides simultaneous records of 2, 3, or 4 currents or voltages. Easy to operate, the PM-18 also saves valuable set-up time.

FOR RELAY TESTING

IN THE POWER PLANT, the PM-18's portability, weighing only 30 pounds, makes it ideal for relay testing. It can be quickly set up where needed.

APPALACHIAN ELECTRIC POWER CO. REPORTS HOW THEY . . .

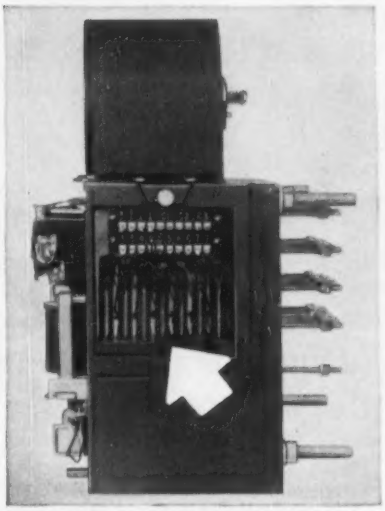
Locate Transmission-line Faults Quickly with New General Electric Automatic Oscillograph

"Savings in time are tremendous. Before our G-E Type PM-13 automatic oscillograph was installed, we often spent days tracking down causes of system failure. Now we know quickly what type and when a system failure occurred," reports E. W. Woody, System Relay Engineer, Appalachian Electric Power Company.

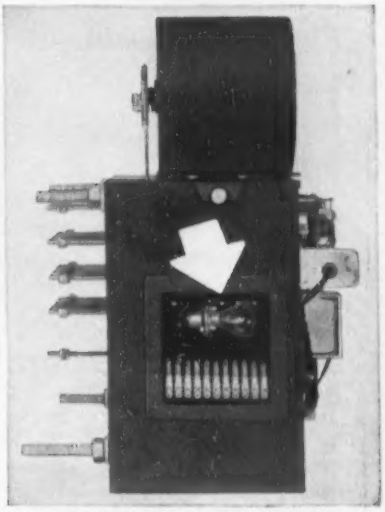
Designed to automatically record power-system transient disturbances, the General Electric Type PM-13 oscillograph simultaneously records seven electrical wave forms that have been pre-selected by the system engineer.

In power-company generating and switching stations, the PM-13 may be used to measure and record such quantities as residual current, phase current, phase-ground potentials, phase/phase potentials, and kw or kva. Information provided by the oscillograph enables the system engineer to analyze the performance of circuit breakers, relays, or systems; and simplifies the locating of system faults.

For further information, contact your local G-E Apparatus representative, or clip coupon below.

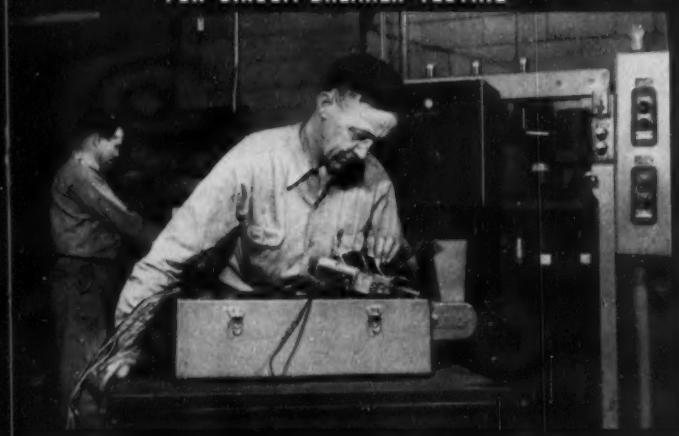


SEVEN GALVANOMETERS (arrow) are easily accessible on right side of PM-13; provide for seven simultaneous records.



LIGHT SOURCE (arrow), left side of PM-13, is easy to replace; no costly, time-consuming optical adjustments are required.

FOR CIRCUIT-BREAKER TESTING



HIGHLY VERSATILE, this general-purpose recorder may also be used advantageously for checking correct circuit-breaker performance. When equipped with a Polaroid-Land film holder, the PM-18 provides finished oscillograms in but one minute.

SECTION A605-77
GENERAL ELECTRIC COMPANY
SCHENECTADY, NEW YORK

Please send me the following bulletins:

- ☐ Type PM-13 Automatic Oscillograph (GEC-396)
- ☐ Type PM-18 General-purpose Oscillograph (GEC-580)
- ☐ Application of Automatic Oscillograph on High Voltage Transmission Lines (GER-533)

NAME .....

COMPANY .....

STREET .....

CITY ..... ZONE ..... STATE .....

GENERAL ELECTRIC

Graphic Meter

(*Continued from page* 85)

Fig 3 shows the corresponding curves obtained after moving the brushes a distance equivalent to the width of one commutator bar in the direction of rotation. Black commutation at the brushes of the generator resulted.

Correct interpretation of these curves is not always easy. On commutating pole machines satisfactory commutation may be obtained by adjusting the brushes. However, such adjustments cause the voltage to increase or decrease with load and may make the machine unstable when operating in parallel. To make proper alterations to the strength of the commuting pole field when parallel operation is necessary, the "Black band" method is of great value (AIEE Transactions, 1941, Vol 60, p 446).

ROLLING BLACKTOP and tamping backfill are two jobs this trailer will do. Roller is actuated through a hand operated hydraulic pump and two double-acting rams

DUMPING is controlled by the two lines from the winch, behind the cab of the truck

Winch Line Operates Dump Trailer having Roller

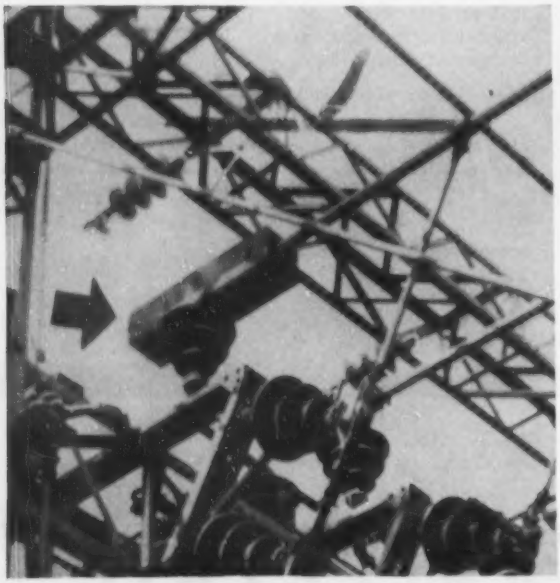
Hauling dirt, materials, or poles are jobs for which Dayton Power & Light Co's new two-wheel, winch-line operated, dump trailer is particularly suited. Use of the trailer avoids the need for hauling dirt and materials on the back of the truck.

A roller on the front of the trailer is used to tamp backfill or smooth black top on small jobs.

The trailer has a 3-ton capacity, is 84 in. long inside and 72 in. wide inside. Sides and front are 14 in. high. Double-acting tail gate is 24-in. high. There is an adjustable chute in the center of the tail gate. Total weight is 4,900 lb.

The compaction roller is 36 in. long, 27 in. in diam, has two spring-loaded scrapers, and is connected to a 20 gal. water tank for moistening the roller. The roller is actuated through a hand operated hydraulic pump and two double-acting rams.

With the trailer coupled to the truck and the trailer wheel clear of the ground, total weight on the roller is 5,460 lb, or 217 lb per in. of roller width. The roller must be raised for traveling.



33-Kv Insulator Hoods Warn, Safeguard Workmen

DONOVAN W. BORING, Ohio Power Co, Portsmouth, Ohio

A 33-kv insulator hood that extends 2.5 ft over a "hot" bus had been used successfully for past 3 years while men work on energized substations. The hood provides two primary precautions for the workmen:

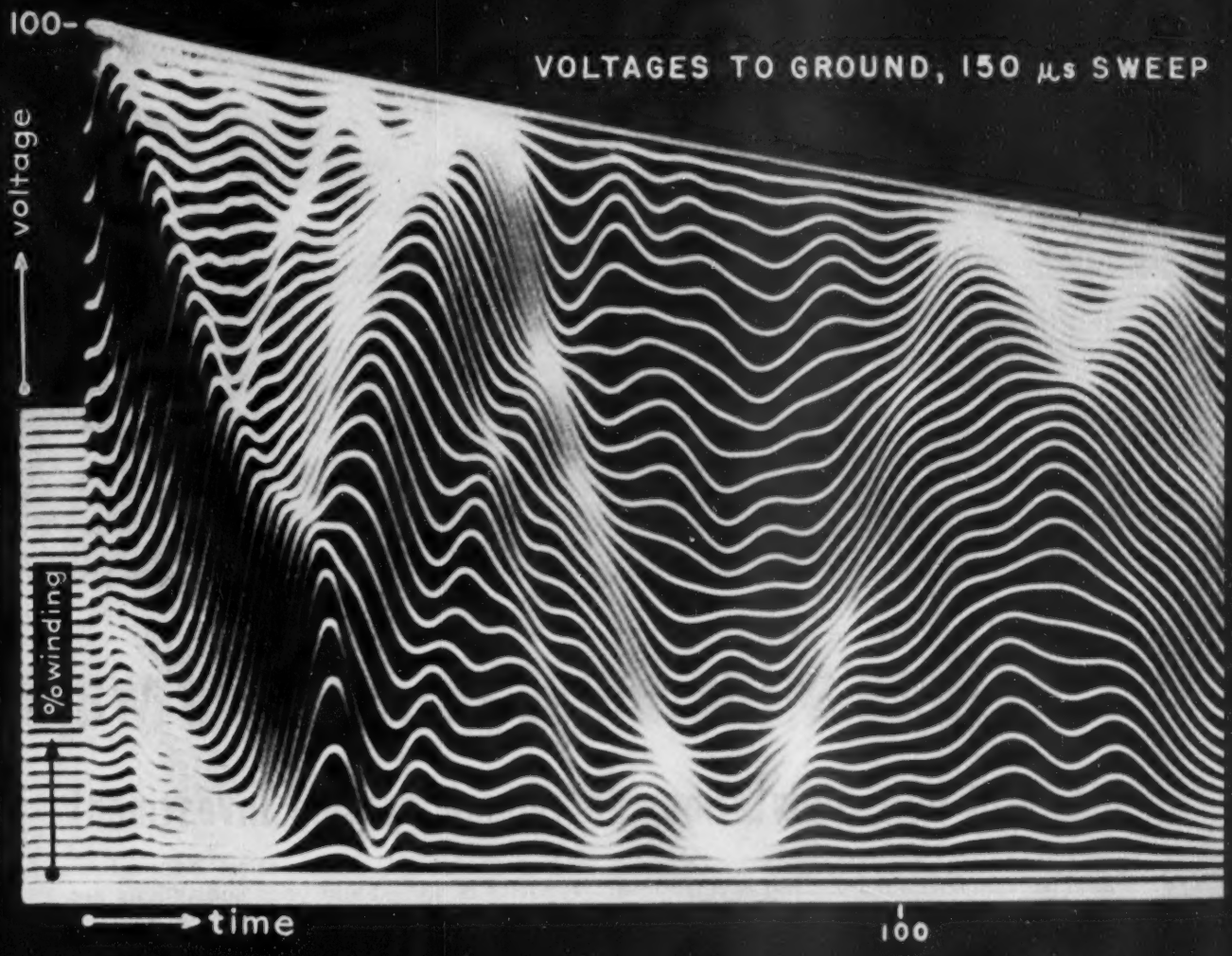
1. An effective barrier to prevent bodily contact with an energized circuit.

2. An effective visual means of identifying hot parts. Several hoods are in use. Each hood costs approximately $10 for materials and required 6 man-hours for construction by the substation crew.

Hoods are made from ½-in. plywood, held together

(*Continued on page* 94)

INSULATOR HOOD extends 2.5 ft. over the bus, has 3 to 4-in. airgap between bus and box side. Plywood hood can be placed over or removed from its position on insulators by a workman using hot sticks



CARDIOGRAM OF A TRANSFORMER

You're looking at the heartbeat of a General Electric power transformer. This oscillogram shows the distribution of impulse voltages to ground at various points in the transformer winding . . . *before* the transformer is built.

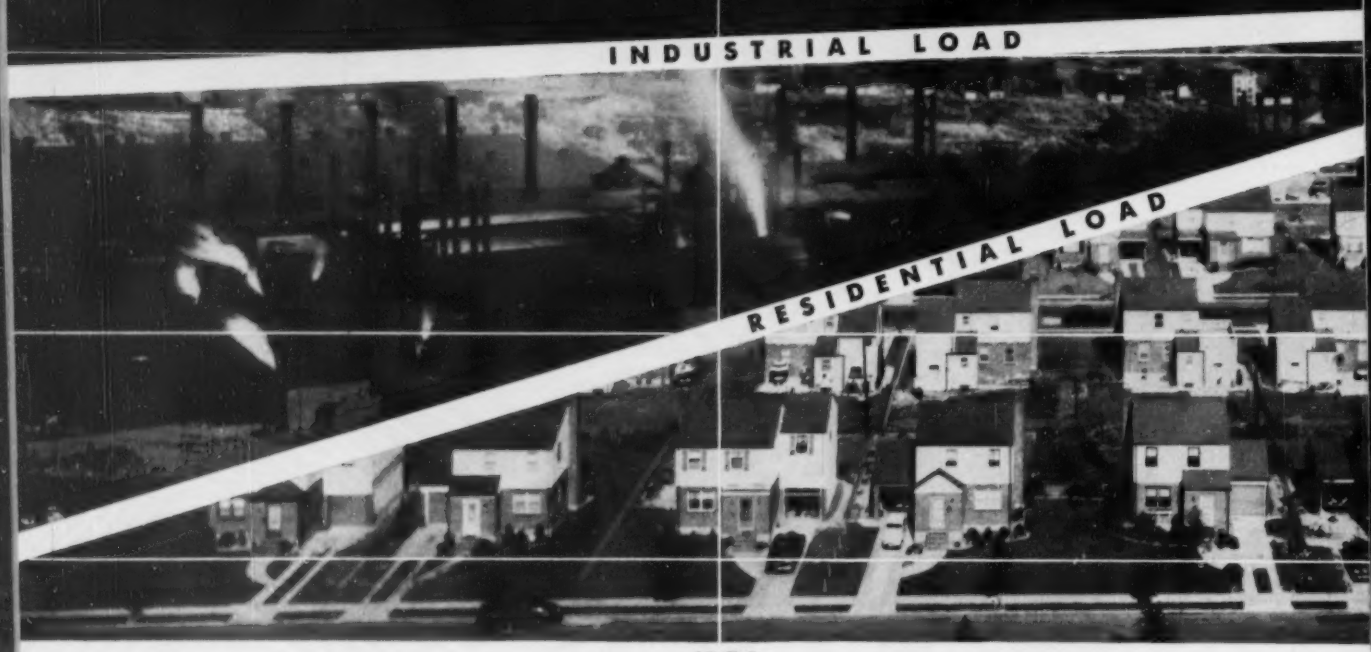
A graph like this—made automatically from an electromagnetic model in less than a minute—helps G-E designers predict the performance of the full-size transformer. "Cardiograms" are just one of the techniques G.E. uses to increase the reliability of large units and to speed up their manufacture. General Electric Company, Schenectady 5, New York. 421-23

Progress Is Our Most Important Product

GENERAL ELECTRIC

Power Transformer NEWS

Residential Load Will Equal Industrial Load



1954

Here's the most economical way

Use G-E Unit Substations to reduce system investment

Add capacity to handle your steadily growing residential market and do it the most economical way with G-E Unit Substations.

No excess investment is needed because you buy no more capacity than is actually required. That means economy today—plus quick and easy expansion to meet the demands of tomorrow.

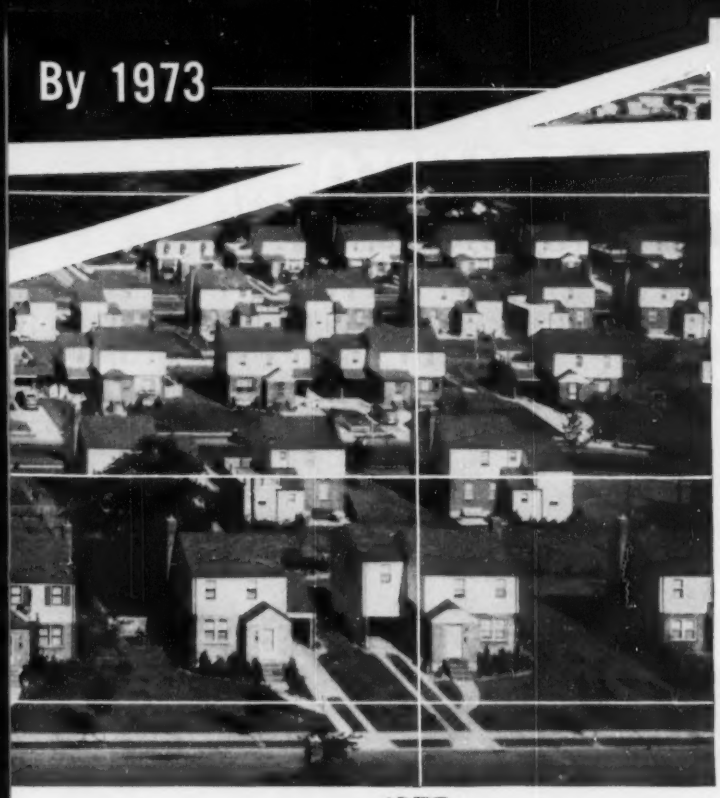
G-E Unit Substations can simplify the problems of expansion as requirements increase. Advance planning and proper substation selection, for example, permit you to expand a radial system into a network system.

Have capacity available when you need it by ordering G-E Unit Substations in advance on the basis of predicted load growth. Then, when your load grows, select sites where capacity is needed and your substations are ready to be installed.

"How to Reduce System Investment" (Bulletin GEA-5847) will help you plan for economical system expansion. It discusses system planning and reveals how other utilities are handling rapidly growing loads. For your copy, write General Electric Company, Section 512-3, Schenectady 5, N. Y.

Progress Is Our Most Important Product

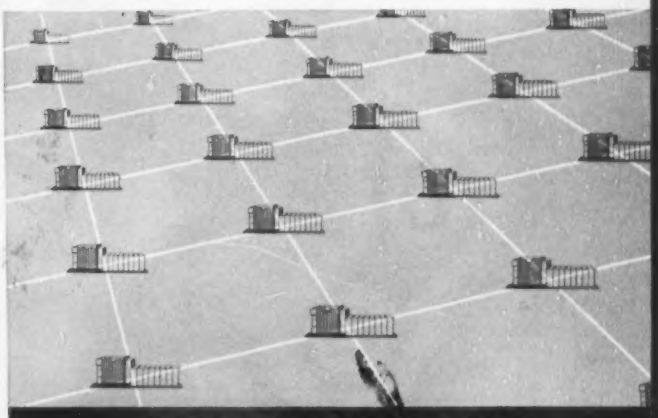
GENERAL ELECTRIC



RESIDENTIAL LOAD IS GROWING rapidly, and is expected to equal industrial load by 1973. Utilities can meet their residential distribution demands yet trim system investment by advance planning with G-E Unit Substations.

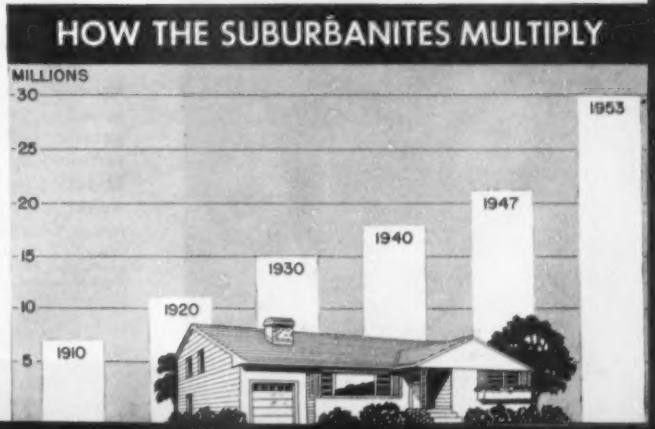
to grow with your residential load

LOCATIONS FOR UNIT SUBSTATIONS are "on the mile every mile" to economically serve residential areas. By properly locating small unit substations for expansion into such a system, utilities can economically grow with increasing demands and provide residential customers with economical power and maximum service continuity.



EVERY MILE ON THE MILE

POPULATION GROWTH in the U.S. since 1947 has been 11%—population in the suburbs has grown 43%. Since 1941 the average kilowatt-hours use per residential customer has doubled every 10 years and is expected to double again in the next decade. This fast-growing suburban growth trend has been going on for a long time—is expected to last indefinitely.



RM POWER TRANSFORMERS

the benefits of ASA standards

RM* brings you all these benefits

Repetitive Manufacture gives you the economy of a standardized product, yet with optional ratings and accessories sufficient to meet most special needs. Ordering is simpler, shipment is many weeks faster, and prices are up to 8% lower than those of nonstandard units.

**RM is the G-E designation for ASA-standardized power transformers 69 kv and below, 501 through 5000 kva single-phase, and 10,000 kva three-phase.*

LOWER PRICE

plus . . . . . .

Stronger liquid-tight tanks

because submerged arc welding strengthens major tank joints

When you need a transformer in the medium range, order a Repetitive Manufacture transformer, and you'll get all the benefits of ASA standards plus many extra advantages that give you better performance, easier handling and less maintenance.

STRONG, LIQUID-TIGHT TANKS, for example, virtually end damage and leaks from shipment and handling. Tanks are stronger because submerged-arc welding, pictured at left, strengthens all major tank joints. In this new process now in use at General Electric's new Medium Transformer Plant, an electrode wire is fed into an arc which is submerged in the granulated flux material deposited ahead of the arc by the welding head. Uniform welding speed is maintained by a driver geared to this head.

Developed by General Electric, this continuous welding process assures stronger, less brittle, more dependable welds of deeper penetration at major tank joints. Damage which can result from shipping and rough handling is minimized and tanks remain liquid tight.

MANY OTHER BENEFITS result from the advanced methods and processes used in General Electric's new plant at Rome, Ga. These include high dielectric strength because vapor-phase drying removes entrapped moisture; superior rust prevention because new Super Melaglyp paint finish lasts up to 150% longer; quicker delivery from faster, conveyorized production. Built solely to produce power transformers in the medium transformer range, this plant serves electric utilities and industry by turning out better products in a shorter time. You can get full information about RM power transformers by contacting your nearest G-E Apparatus Sales Office, or writing for Bulletin GEA-6108 to General Electric Company, Section 422-10, Schenectady 5, New York.

Progress Is Our Most Important Product

GENERAL ELECTRIC

SIMPLIFIED PURCHASING

SHORTER SHIPMENT

G.E.'s NEW ROME, GA., TRANSFORMER PLANT—built specifically to meet the growing trend to standardize power transformers.

Insulator Hood

(*Continued from page* 88)

with ¼-in. dowel pins, and constructed so that there is a 3 to 4-in. air gap between the bus on which it rests and the sides of the box. Several coats of clear insulating varnish were applied to all surfaces of the hood to keep it dry, preserve the wood, and maintain electrical insulation.

Position of the insulating hood on the insulator is indicated in the illustration. After men have completed their work in a substation, the hoods are removed by reversing the process of installation.

TRAILER-DERRICK combination reaches locations up to 35 ft from truck and can be winched into location or spotted with small truck

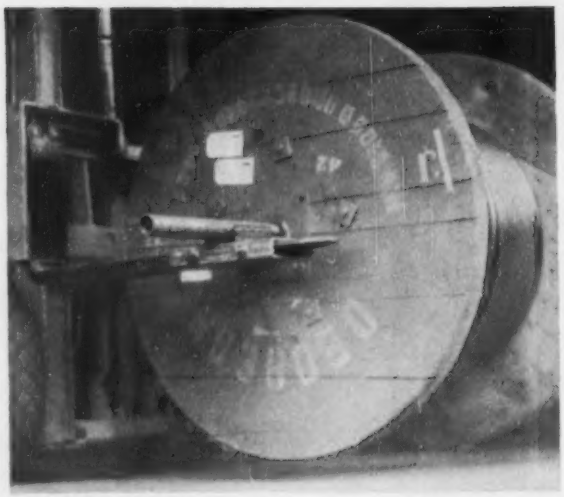
Derrick-Equipped Trailer Sets Poles in Soft Ground

L. L. CLARK, Supt of Transportation, Public Service Co of Indiana, Inc, Plainfield

Public Service Co of Indiana has equipped a pole trailer with a line-truck pole derrick for setting poles in difficult locations that can't be reached with a standard truck and derrick. It is used only where the truck cannot be conveniently spotted, such as where the ground is soft or uneven.

Middle leg of the derrick can be removed from the trailer and set on the ground to give added lifting capacity and permit the setting of taller poles. Poles up to 60 ft long can be set without much difficulty with the derrick-equipped trailer.

Where it is necessary to set poles more than 35 ft from the truck the trailer derrick can be winched into location or attached to a small truck.



FORK-LIFT ADAPTERS are tilted toward the truck and expedite handling of wire reels. Formerly an entire line crew was required

Fork-Lift Adapter Facilitates Handling Wire Reels

E. M. PAYNE, Roanoke Storeroom, Appalachian Electric Power Co, Roanoke, Va.

A fork-lift adapter handles wire reels safely and expeditiously. Two local-made adapters cost approximately $5 for material and one man-hour for welding.

With this equipment on truck forks, one man can safely and quickly move reels of wire. Formerly an entire line crew was required. The former hazard of handling broken reels is also eliminated. By using a reel roller in conjunction with the truck lift, wire can be easily and safely transferred from one reel to another. After being in service two months this fork-lift adapter paid for itself in saving time and men's backs.

Each adapter consists of a cradle welded to a socket that slides over truck forks where it is clamped to support axle of wire reel. Socket is made of ¼-in. steel plate with two ½-in. set screws. The cradle is made from a piece of 3-in. pipe cut lengthwise and welded to socket and angle irons.

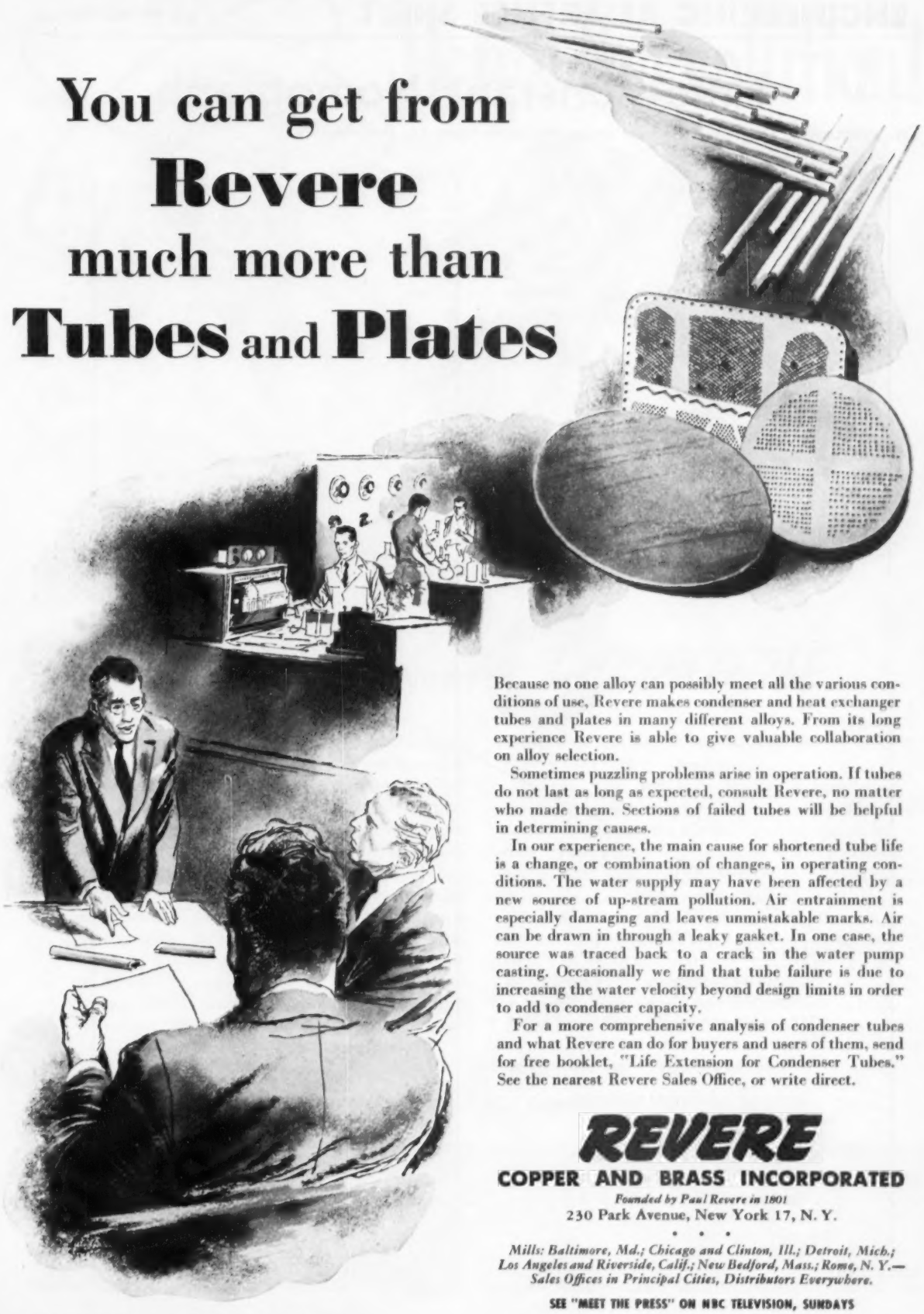
To use the equipment, an adapter is slid over each fork lift and locked in place with set screws. A 2-in. pipe strong enough to support the wire reel is used for its axle which is held by cradles on adapters. Weight of the reel is sufficient to keep its axle in cradles without danger of rolling out. But as an additional precaution the adapters are tilted toward the truck.

Test Cabinet Simulates Meter Field Temperatures

To test meters and switches of new design under normal operating conditions Cincinnati Gas & Electric Co's meter department designed a 12-cu-ft test cabinet with a temperature range from −20F to +250F. The cabinet replaces the former method of using a wood box, dry ice,

(*Continued on page* 100)

You can get from **Revere** much more than **Tubes** and **Plates**



Because no one alloy can possibly meet all the various conditions of use, Revere makes condenser and heat exchanger tubes and plates in many different alloys. From its long experience Revere is able to give valuable collaboration on alloy selection.

Sometimes puzzling problems arise in operation. If tubes do not last as long as expected, consult Revere, no matter who made them. Sections of failed tubes will be helpful in determining causes.

In our experience, the main cause for shortened tube life is a change, or combination of changes, in operating conditions. The water supply may have been affected by a new source of up-stream pollution. Air entrainment is especially damaging and leaves unmistakable marks. Air can be drawn in through a leaky gasket. In one case, the source was traced back to a crack in the water pump casting. Occasionally we find that tube failure is due to increasing the water velocity beyond design limits in order to add to condenser capacity.

For a more comprehensive analysis of condenser tubes and what Revere can do for buyers and users of them, send for free booklet, "Life Extension for Condenser Tubes." See the nearest Revere Sales Office, or write direct.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

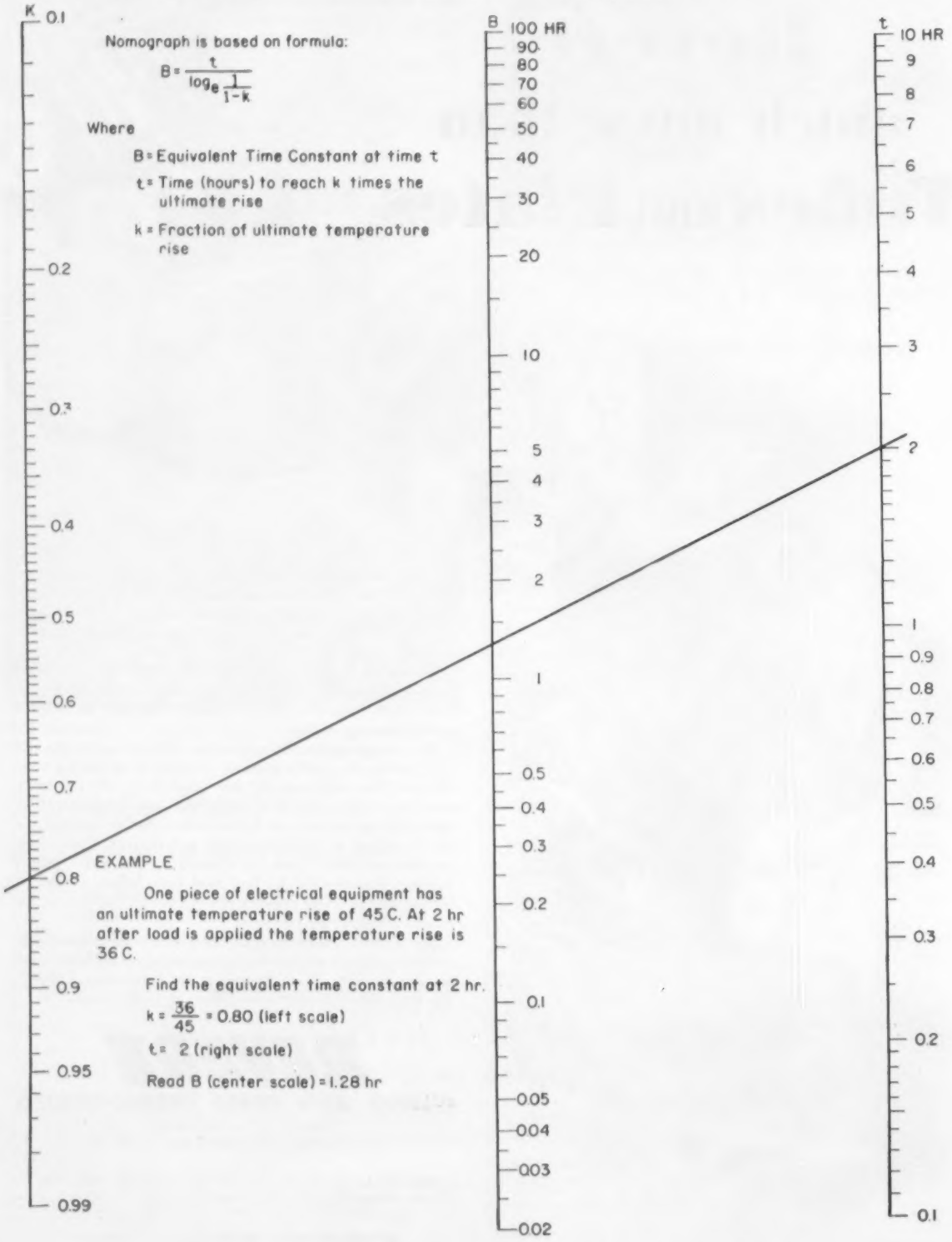
• • •

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.— Sales Offices in Principal Cities, Distributors Everywhere.

SEE "MEET THE PRESS" ON NBC TELEVISION, SUNDAYS

Time-Constant Nomograph

W. KEGELMAN, Engineering Development Section, Philadelphia Electric Co., Philadelphia, Pa.



Nomograph is based on formula:

$$B = \frac{t}{\log_e \frac{1}{1-k}}$$

Where

B = Equivalent Time Constant at time t

t = Time (hours) to reach k times the ultimate rise

k = Fraction of ultimate temperature rise

EXAMPLE

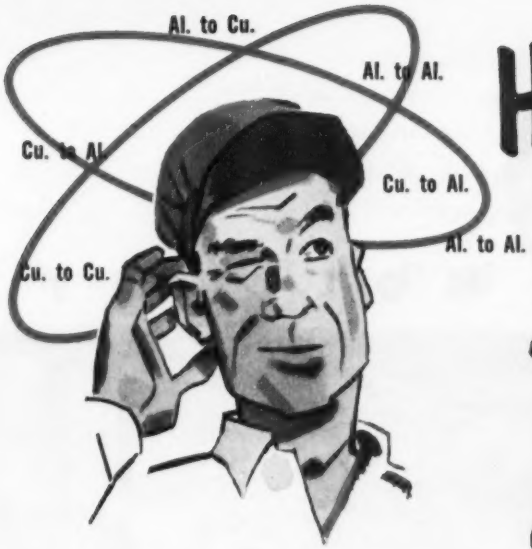
One piece of electrical equipment has an ultimate temperature rise of 45 C. At 2 hr after load is applied the temperature rise is 36 C.

Find the equivalent time constant at 2 hr.

$k = \frac{36}{45} = 0.80$ (left scale)

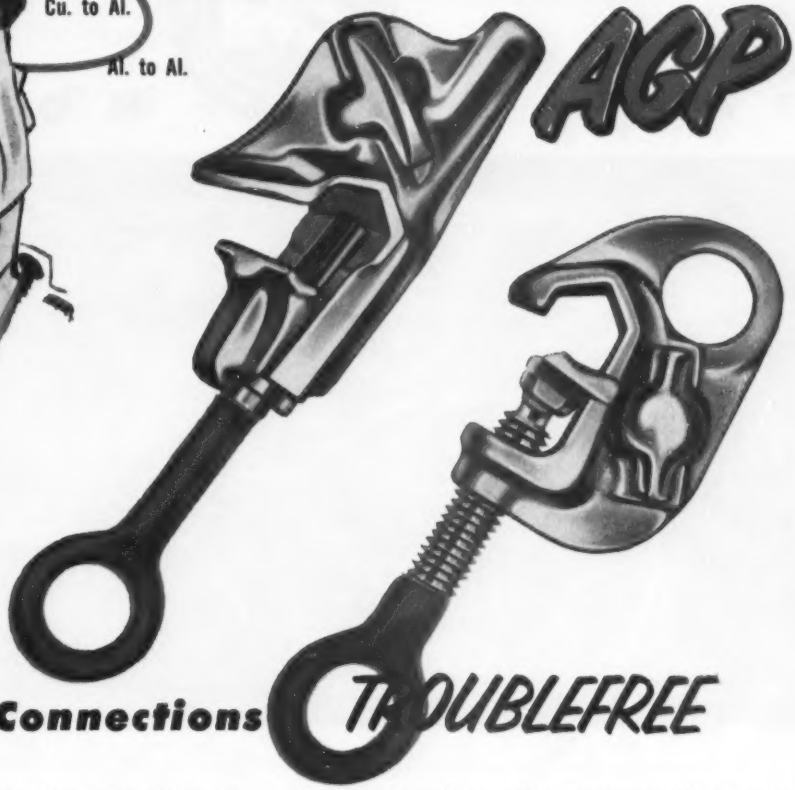
t = 2 (right scale)

Read B (center scale) = 1.28 hr



Here's the solution!

AGP*



Keeps Tap Connections TROUBLEFREE

Chance AGP Tap Clamps, the first successful multi-purpose clamps, solve today's tap connection headaches. AGP Clamps can be used successfully with Aluminum to Copper, Aluminum to Aluminum, Copper to Aluminum, or Copper to Copper. That's because they are given a *properly applied coating* of high-density, fortified cadmium—to a thickness of .001". Tests undertaken by conductor manufacturers and several large power companies ... and actual field service, all prove that Chance cadmium coating resists corrosion and electrolysis in all types of connections.

Heat treated aluminum alloy bodies are light in weight. This makes them easy to handle on a clamp stick and lengthens conductor life by minimizing the effect of vibration.

Contacts stay tight—the thermal expansion of the clamp is uniform with aluminum conductor ... and since the thermal coefficient of copper is less than that of aluminum, the clamp will not deform copper conductor even under extreme temperature variations. The conductor is protected at all times.

Specify Chance AGP Clamps to solve your tap connection problems. They will eliminate the possibility of error in connector applications—reduce inventories—and greatly simplify your stocking problems. AGP Clamps are available in both the Protected Connection (PC) and Perma-Grip designs.

* **CHANCE *Aluminum General Purpose – the Tap Clamp with the RED Eye Screw.***

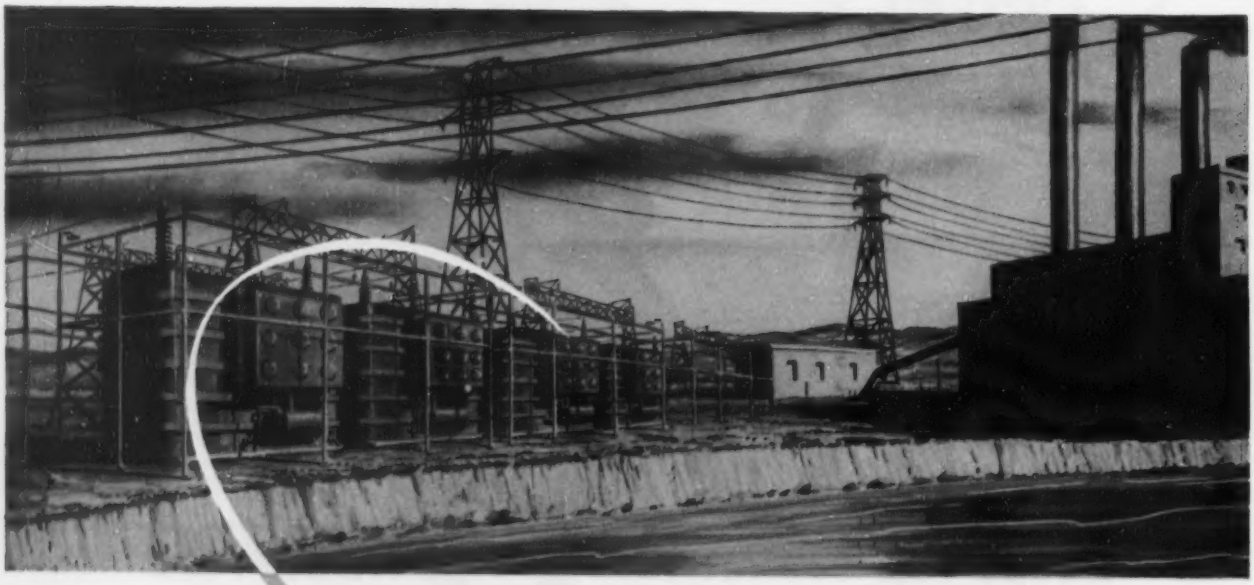
abc INDUSTRIES

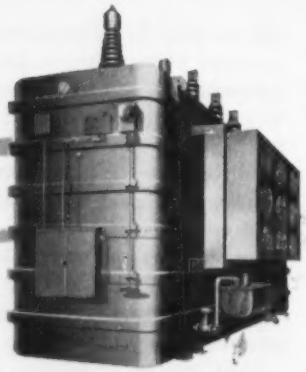
A·B·CHANCE CO·

CENTRALIA, MISSOURI · SAN FRANCISCO, CALIFORNIA

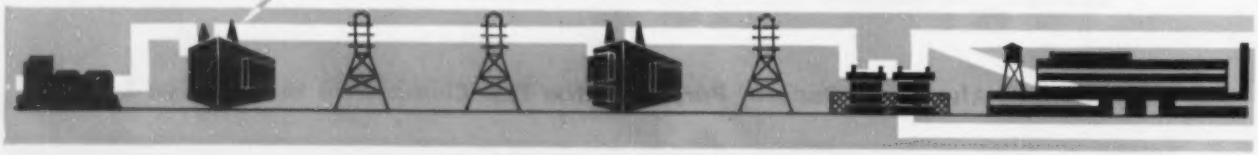
MOLONEY ELECTRIC

MOLONEY..





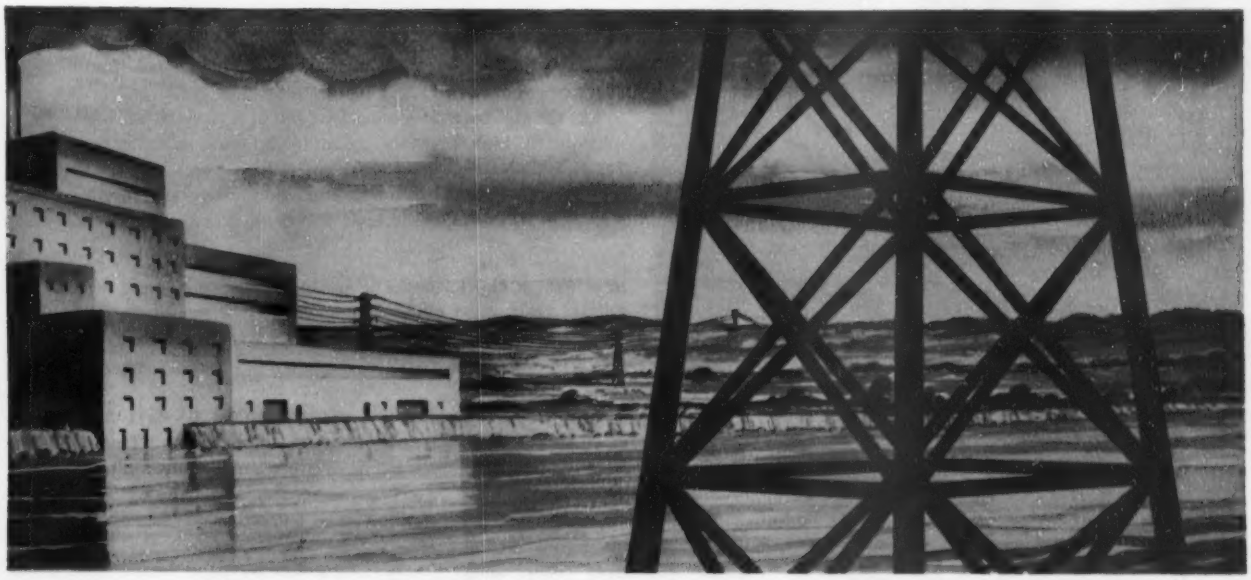
Moloney Power Transformers, engineered and built to your specifications, are available in any Kva and voltage rating for utility and industrial applications.



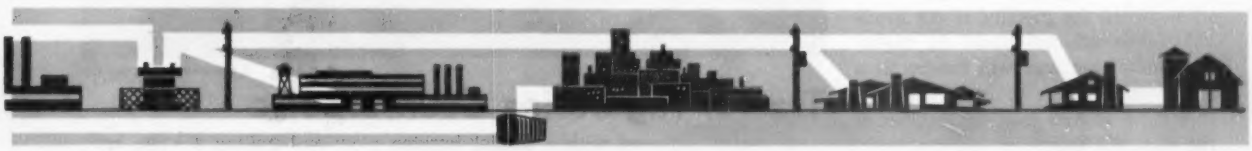
SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES

For years the name Moloney on a transformer has meant a better product. As utilities have grown and become more complex, so have transformers. All this expansion in the power field has been paralleled by expansion here at Moloney. Many utilities feel that Moloney Transformers are the best you can buy. They are right, because—

. . ALL ALONG THE LINE!



Take, for instance, Power Transformers; Today utilities demand transformers in higher Kva and voltage ratings. Yet, while Kva and voltage ratings are greater, and still growing, certain factors such as size are still limited. To keep pace with utility demands, Moloney expanded its facilities and developed new and improved designs to fit today's *and* future needs. Transportation limitations have influenced transformer design. To overcome these limitations, Moloney Engineers adopted shielded concentric layer type high voltage coils. Concentric layer high voltage windings possess both high mechanical strength and high impulse strength. With this type winding it is now possible to produce transformers of today's or tomorrow's ratings, within space limitations of present transportation systems. MESA-14



MOLONEY ELECTRIC COMPANY

Power Transformers • Distribution Transformers • Step Voltage Regulators • Regulating Transformers • Load Ratio Control Transformers • Unit Substations • Network Transformers • Constant Current Transformers • Capacitors • Transformers For Electronics

AT ST. LOUIS, MO. AND TORONTO, ONT., CANADA

Test Cabinet

(*Continued from page* 94)

and a heater to produce temperature extremes encountered in outdoor meter operation.

The new cabinet is large enough to test six electric meters or time switches at a time. Overall dimensions are slightly over 3 ft square by 6 ft high. The inside stainless-steel test chamber is 2 ft square by 3 ft high. Six in. of sheet cork insulate the inner chamber from the outer steel cabinet which has a white Ploymerin finish.

There is a refrigeration unit and an electric heating element with controls on the front of the cabinet. Controls can be set to operate either the refrigerating unit or the heater to produce and maintain test temperature.

The refrigerating unit is in the lower 2 ft of the cabinet, and the heating element is in the floor of the inner test chamber. Refrigerating coils of copper tubing surround the inner walls of the test chamber.

On the right hand side of the cabinet a slot, 10 in. wide and one in. high, provides access to the inner test chamber for test leads.

With the new cabinet operating conditions are easy to simulate and equipment tests can be made quickly.

NEW TEST CABINET makes it possible to test meters and time switches easily under all field temperatures from — 20F to 250F

Waxed Insulators Ease Cleaning Job

H. L. RUDOLPH, Supt of Substations, Southern California Edison Co, Los Angeles, Calif.

Dissolved wax applied to substation insulators eases the job of cleaning units installed in dirty or contaminated location. Southern California Edison Co crews find a clear solution of paraffin wax in naptha applied to insulator surfaces leaves a smooth surface that lasts up to 90 days, depending on the location. Accumulated dust and dirt may be wiped easily from the waxed surface.

Paraffin wax is preferred because of its high melting point of 130F. The higher the melting point, the longer the coating will last on surfaces exposed to high ambients. The most satisfactory vehicle is aviation gasoline. However, naptha is a good substitute when the gasoline is not available. The vehicle should be highly volatile so that wax will harden in a minimum time.

Wax is shaved into the vehicle at the rate of 1 lb per ½ gal of vehicle. It is usually desirable to warm the vehicle so that the wax will dissolve more readily. No heating is required if the vehicle has been standing in a hot sun or warm place. The mixture will congeal if left in a cool place, but will liquify readily in the sun.

Two methods are used by Edison to apply the wax solution. In the first, the de-energized insulators are cleaned thoroughly. Then they are wiped with a cloth saturated with the wax solution, but with surplus liquid wrung out. At one location where this method is used, up to 90 days may elapse between applications. Insulator surfaces are cleaned only immediately prior to the application. This method has worked well for about four years.

(*Continued on page* 105)

Caterpillar Tractor Co

Tractor Rig Buries Counterpoise

A tractor equipped with a special burying plow and pulling a stone boat was used by Boston Edison Co to bury counterpoise cable in rocky soil at the rate of over a mile a day. Equipment for the plow consisted of a standard tool bar, a lifting boom, sheaves, and a modified subsoiler tooth that fed the cable into the ground.

A stone boat was dragged behind the tractor to carry the cable reel and also cover and smooth the cut. Two men were needed for the job. One operated the tractor, while the other checked for possible obstructions.

keep a hold on conductors with *Clamptops*

Conductors held in O-B Clamptops *do not slip!* Clamptops exert enough holding pressure to make the insulators and the wood cross-arm the critical members when heavy loadings come on the conductors. When you consider that typical O-B Clamptop Pintypes and Posts have cantilever strengths ranging from 2000 to 2800 pounds, you can see that the Clamptop grip must be strong indeed!

This sort of strength is important in wind-swept, snow-burdened climates, or in the southern hurricane area. Clamptops in service in these places have stood up to the worst nature has to offer, with no record of a conductor being loosened.

How long does it take to make an approved tie connection of similar strength? How many linemen *want* to make such a tie—especially a hot tie—when the simpler, safer clamptop connection can be made in a far shorter time? *Your* answers to these questions emphasize further Clamptop advantages—speed and safety.

After an experience with a field trial with O-B Clamptops, we're sure you'll say, "Clamptops go on the Standards List—*today!*"

INVEST IN SERVICE CONTINUITY WITH Ohio Brass **INSULATORS**

MANSFIELD (B) OHIO, U. S. A.

In Canada: Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

lineman, Spare that Wire!

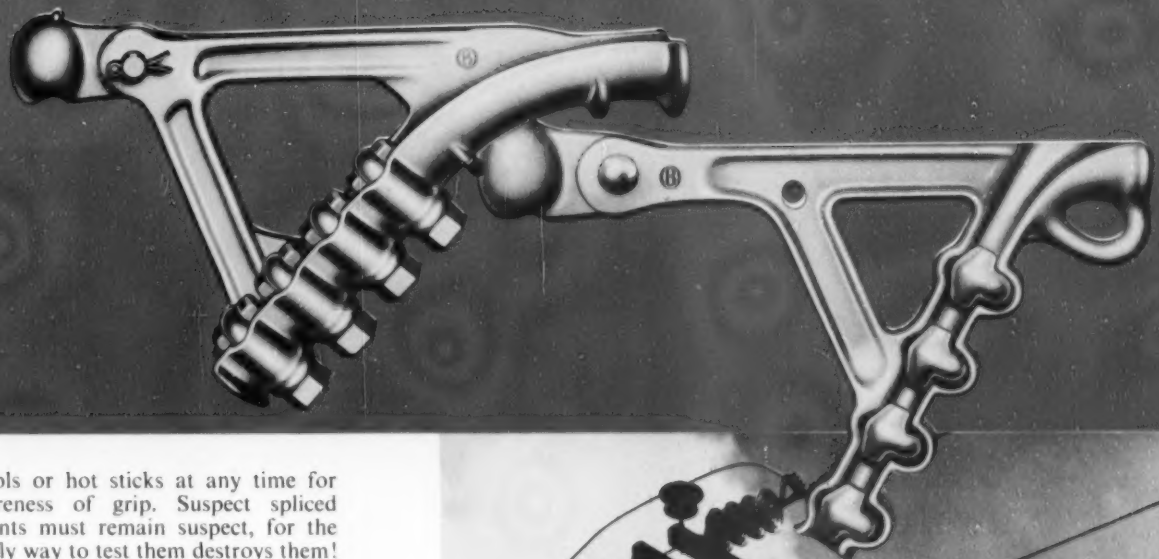
don't cut it ....loop it!

Cutting a conductor in two at every strain and dead-end is an extravagance. It takes time, costs money, and reduces conductor conductivity, and "cut and splice" methods do not have lasting holding power.

Transmission line continuous jumper loops built with O-B Hardware are completed in minutes instead of the hours required for cable-cutting methods. Strength of the cable is unimpaired. Conductivity, ditto. Holding power of the strain clamps, developed by spiral snubbing action, exceeds the maximum design tensions usually employed with ACSR, all-aluminum, or copper conductor.

Three metal compositions used for O-B Strain Clamps permit matching of cable and clamp metal, with an important reduction in electrolytic corrosion as the benefit. The non-ferrous clamps offer the additional bonus of power savings from their non-heating characteristics.

Another big point: O-B Strain Clamps can be checked with hand

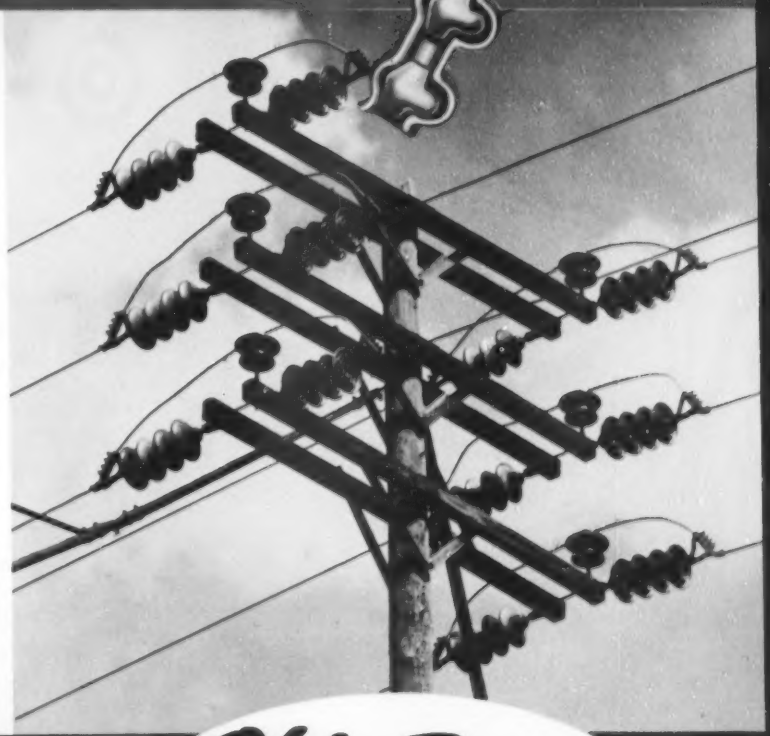


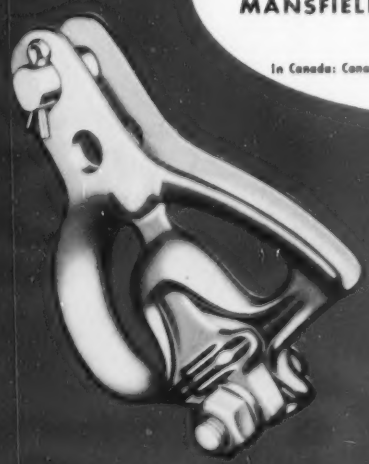
tools or hot sticks at any time for sureness of grip. Suspect spliced joints must remain suspect, for the only way to test them destroys them!

The same arguments apply to distribution construction. Continuous Jumper Loops, with O-B Hardware, are actually cheaper to build in both time and material than those requiring splicing. O-B clamps develop full working loads without conductor slip. A full-strength anchorage can be completed in a few minutes, requiring no more field equipment than a common hand wrench and no special skill. Best of all, uncut cable retains full strength and conductivity.

Hardware shown here handles all manner of distribution work at strain and dead-end points. One of the styles will suit—will probably improve, as a matter of fact—your distribution building methods!

And so we repeat—don't cut your conductor in two; loop it instead, and spare yourself considerable time and expense!





Ohio Brass

MANSFIELD OHIO, U. S. A.

In Canada: Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

one or a thousand!

Quantity is no bar to doing business with Graybar. Whether you need one O-B six-inch suspension insulator or a thousand, your order to Graybar gets quick attention—and you get quick delivery!

Ohio Brass and Graybar work together to maintain a reputation for quick delivery. Stocks at over 100 Graybar houses are set at adequate levels for day-to-day business; larger orders get direct shipment from Ohio Brass to the point you designate. Further, we make it a fetish to see that Graybar stocks are maintained, and that we have supplies on hand at the factories as well.

Thus your order to Graybar for Ohio Brass Distribution Materials is seldom (if ever) held up because of low stocks. If you come to the will call desk for "just one," if Graybar is to deliver a hundred, or if a thousand are sent from Ohio Brass, you can depend on prompt delivery!

Ohio Brass
MANSFIELD OHIO, U. S. A.

4428-H

Waxed Insulators

(*Continued from page* 100)

In the second method, the wax solution is applied by brush. Edison has found a standard 2-in. flat brush to be satisfactory for most cases. Insulators are painted by starting at the top of the stack and brushing freely. Surplus solution is brushed-up as would be done during an ordinary painting job.

At one location on the Edison system, adjacent to a cement plant, application by brush lasts up to 60 days. Cement dust may be wiped off the waxed insulators quite easily, however. At this substation, the regular maintenance crew inspects the insulators. If necessary, they arrange for an outage and clean the insulators or apply a new wax coating.

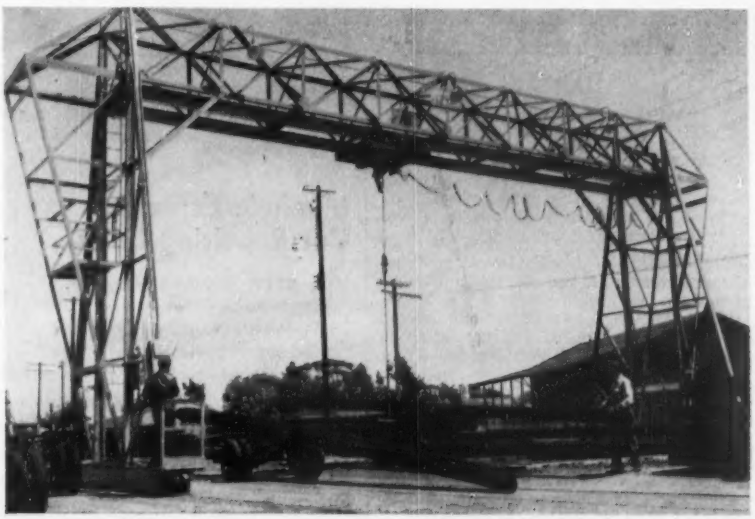
Certain precautions are necessary in using the wax solution. Extreme care must be exercised at all times because the solution is highly inflammable. A rain or heavy fog occurring immediately after application may remove some of the solution if it has not hardened sufficiently. Where ambient temperatures are high, the coating deteriorates more rapidly. This is especially true on surfaces that are directly in the sun.

Ladder Rungs Treated; Tested for Safety

Methods used in the Bell System to reduce and detect decay in ends of ladder rungs are expected to reduce rung failure, increase ladder life, and lower maintenance costs.

Reduction of decay in ladder rungs is accomplished by dipping them in a pentachlorophenol-mineral spirits solution for 10 min prior to assembly. A 5% concentration of pentachlorophenol in petroleum base is used. The solution also contains a water-repellent material that further minimizes the risk of infection by fungi. This procedure adds slightly to the cost of a new ladder.

Detection of decay in ladders returned from the field for repairs consists of sounding the rungs by means of a wood mallet. This method has been tested and is now a standard repair-shop procedure.



Gantry Crane Speeds Pole Loading

Only a storekeeper and one storeroom helper are needed to load poles at the service center of Coast Counties Gas & Electric Co, Santa Cruz, Calif. Use of the gantry crane cuts the loading time of a trailer full of poles to a few minutes. Formerly, line crews using truck winches did their own loading, a more time-consuming and more expensive method. Cost of the crane was about $10,000.

RICHARDSON-ALLEN

AUTOMATIC FLOAT CHARGERS

Why take chances?

Keep your substation batteries properly and fully charged with a

DEPENDABLE BATTERY CHARGER

RICHARDSON-ALLEN Automatic Chargers feature—

- ★ Saturable reactor and magnetic amplifier control
- ★ Constant DC voltage ±1%
- ★ Automatic line correction
- ★ Long-life selenium rectification
- ★ Integral boost charge, if desired

Write for technical bulletin. Prices on request.

RICHARDSON-ALLEN CORPORATION

a manufacturing affiliate of

Wesley Block & Co., Inc.
39-15 Main St. Flushing, N. Y.

In Canada: Richardson-Allen of Canada, Ltd.
370 Victoria St., Toronto, Ont.

No. 5 in a series discussing why ASCO® means adequacy in Automatic Transfer Switches

...why "Adequate Thermal Capacity" is vital in Automatic Transfer Switch Design

The transfer switch must be designed with adequate thermal capacity so that, in case of a fault, the contacts will remain closed long enough for overcurrent devices to operate. Without this capacity severe damage to the transfer switch and other circuit elements may result.

The transfer switch should be capable of interrupting normal currents, including inrush or stalled rotor currents. It is not intended to open fault currents, nor is it designed for this purpose. Overcurrent devices on the service side of the Automatic Transfer Switch interrupt the circuit in the event of a fault.

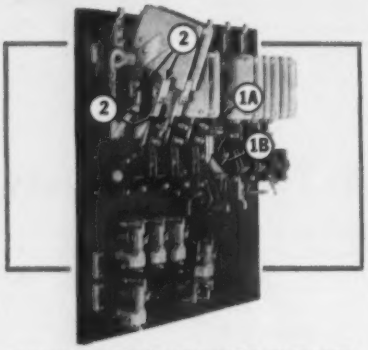
High thermal capacity is particularly important in high K.V.A. systems where a fault results in extremely high currents. On such systems it may be necessary to select a transfer switch on the basis of short time rating rather than maximum load current (see chart).

Time Delay on Momentary Outages

Recognition of the increased K.V.A. of distribution systems has led to development of the ASCO "Time Delay on Momentary Outage" feature supplied as a built-in component of the ASCO Transfer Switch. A Switch equipped with this device will not open instantaneously under any conditions. In the event of a fault this device would prevent Transfer Switch operation until the overload devices have cleared the circuit.

Electromagnetic Effects

The configuration of the contact structure is also vital in determining the ability of the switch to remain closed under fault conditions. During the interval when high currents exist, strong magnetic fields surround the conductors. These magnetic fields tend to open the contacts. With the ASCO rugged mechanically-held design, no "contact opening" is possible.



STANDARD ASCO AUTOMATIC TRANSFER SWITCHES HAVE HIGH THERMAL CAPACITY TO MEET FAULT CONDITIONS

Switch Size (Amperes)	Short Time Ratings* (Amperes)
	Not less than
30-100	2,000
125-300	15,000
400-1,000	20,000

*Current which the switch can safely handle for one second.

There is good reason why ASCO Switches rate high in thermal capacity:

1. Power opening and power closing by means of momentarily energized coil (1A) and powerful linkages (1B) provide ample contact pressure at current carrying contacts.
2. Contacts (2) have the extra bulk required for high thermal capacity. This bulk dissipates heat quickly—important in preventing temperature rise and oxidation of contact surfaces with subsequent welding.

Summing Up: Automatic Transfer Switches transfer the connected load from the normal to the emergency supply when normal fails or is substantially reduced. Upon restoration of normal the switches retransfer the load. The important differences between designs is that Magnetically Held Switches depend on adequate line voltage for holding power and tend to open under fault conditions causing serious damage. ASCO Electrically Operated, Mechanically Held Transfer Switches have the thermal capacity to remain closed until the circuit is cleared.

For further information on Automatic Transfer Switches, send for a reprint of the first four ads in this series and for Publication 502 explaining how to select this equipment.

ASCO Solenoid VALVES

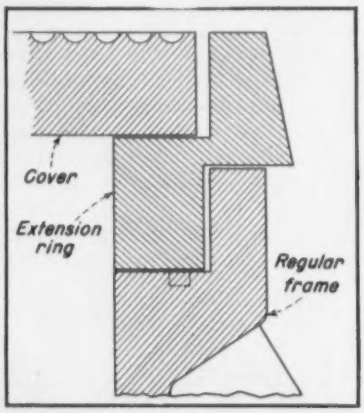
Automatic Switch Co.
297 Lakeside Ave., Orange, New Jersey

ASCO Electro-Magnetic CONTROLS

Compression Sleeves Replace Sling Splice

Time is saved in Cincinnati Gas & Electric Co's shops by using compression splices to make up wire slings for crews. These slings were formerly made up by weaving the wire strand to form loops.

Compression sleeves are of the type used for making up copper-clad guys. Slings made with the compression sleeves have been tested. Those made of $\frac{7}{16}$-in. wire rope, which is rated at 22,000 lb, held up to 25,000 lb. And the $\frac{3}{8}$-in. strand rated at 11,000 lb, broke at 12,000 lb. In each case the strand broke, the compression sleeve did not slip.



EXTENSION RING FITS into cover seat of standard manhole and is spot welded to prevent vibration. Ring raises cover 2½ in.

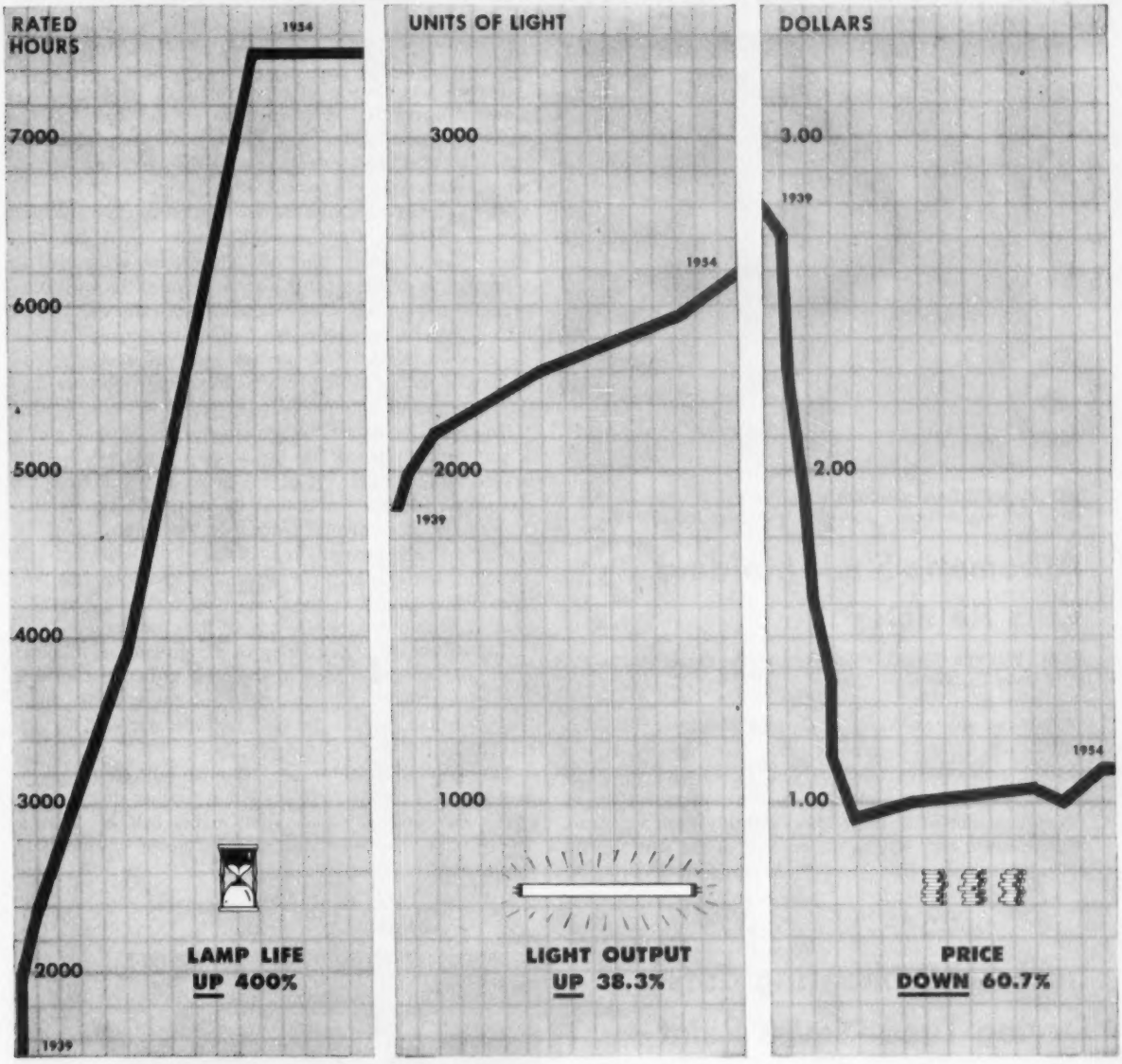
Manhole Extensions Cut Repairing Costs

E. J. BEST, Distribution Engineer, Southwestern Gas & Electric Co, Shreveport, La.

To avoid expensive manhole changes when paving grade is changed, Southwestern Gas & Electric Co has designed a manhole extension ring. The ring raises the elevation of the manhole cover to match new paving and resurfacing of streets and alleys.

Extension ring fits into the cover seat of the standard manhole ring and is spot welded in place to prevent vibration. One or more rings may be installed and each ring raises the manhole cover a distance of approximately 2½ in.

YOU EXPECT THE BEST VALUE FROM G-E FLUORESCENT LAMPS



16 times more value for your fluorescent lamp dollar than in 1939

Today you don't have to pay more than $1.10 for the finest fluorescent lamp made: General Electric. Fifteen years ago it would have cost you $2.80 or $1.70 more. And while price has been going down, we've been pushing quality up. General Electric has upped light output 38%, increased lamp life 400%.

In terms of what you really judge lamps by, a General Electric 40-watt fluorescent lamp that lists at $1.10, plus tax, today is a *16-times bigger value than it was in 1939.*

For further information, contact your G-E lamp supplier or write to Lamp Division, General Electric, Department 166-EW-10, Cleveland 12, Ohio.

Progress Is Our Most Important Product

GENERAL ELECTRIC

SPOILED MOLDS are completely eliminated and considerable time is saved with this automatic shell molding machine having 46-kw oven

Automatic Shell Molding Cuts Rejects

L. M. DURYEE Industrial Power Engineer, The Connecticut Light & Power Co, Waterbury, Conn.

Automic shell molding at Eastern Malleable Iron Co, Naugatuck, Conn., eliminates many hand operations and spoiled molds, saves time and makes superior products.

The shell process molds are made from a mixture of dry plastic and sand, using an electrically heated pattern. This makes a shell having the contour of the pattern with ¼-in. thickness—strong enough to stand the pouring of the metal. The castings produced have close tolerances without being machined.

Hand operation was originally used, to determine time-temperature cycles. The attention of the operator was required continuously. Now, with completely automatic operation, the operator's time is used in stacking finished molds, ready for delivery to casting shop.

Saving of time also results from the complete elmination of spoiled molds. They are neither under-baked, nor over-baked with automatic time and temperature control. This is impossible to achieve if the operator timed the sequences, because human operators cannot duplicate exact time cycles, as can an automatic timing instrument. Micro-switches on the rails also provide far more accurate positioning of the mold than can human hands, because they duplicate results automatically.

The operator places the pattern on the carriage and it is automatically taken into the 46-kw electric oven. After a predetermined interval of 1½ min, in which time the temperature is raised to 350 F, the carriage takes the pattern to the investment chamber at the right. Here the plastic and sand mixture drops down on the heated pattern and fuses into a solid. The investment chamber then rolls over and back allowing the excess plastic and sand mixture to drop off into the opposite half of the chamber.

The pattern with its coating of plastic-sand then comes down and is carried back to the oven to be held for one minute at 1000 F. This completes the curing of the shell. The oven door opens, the carriage rolls out and the operator lifts the shell off the pattern.

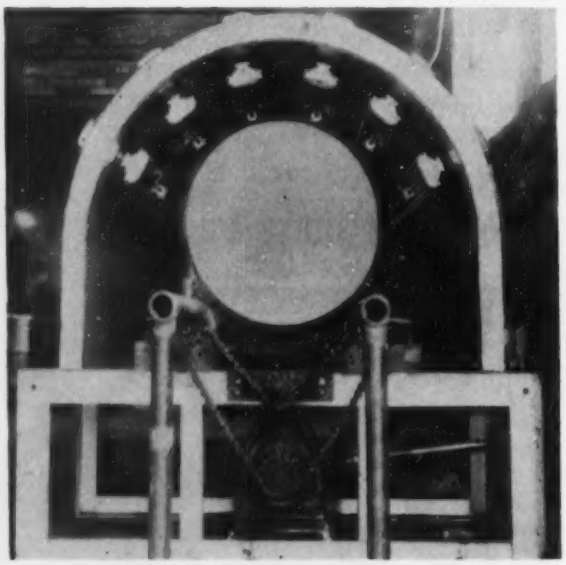
The operator then presses a button and the entirely automatic cycle is repeated. Every 3 min another shell is completed and removed. Each shell makes half of a mold. These halves are assembled and the metal is poured to produce the finished casting.

Infrared Preheating Cuts Drying Time—Saves Paint

The use of a radiant infrared tunnel at the Barrel Remodeling Co, Kansas City, Mo., has cut paint drying time on steel barrels from 3 to 4 hr to 15 min. The drying step no longer limits the rate of production. Paint adheres well to the preheated surface. There is no blistering at 175 F and the paint dries fast and evenly.

A considerable amount of paint is also saved by this heating arrangement. The heat appears to reduce the viscosity of the paint, permitting a given quantity to be applied evenly over a larger area and minimizing the tendency of thicker coats to pile up or run at certain places.

The reclaimed barrels are placed on revolving rollers so that heat is applied uniformly and rapidly just before spray painting. Six radiant infrared units are arranged to form a compact open-end tunnel. Just 30 sec is required to preheat the barrels to the required temperature of 175 F. After heating, the barrels are placed on end-spinners in the spray booth for an equally even coating of paint.



Edwin L. Wiegand Co

PREHEATING STEEL BARRELS in radiant infrared tunnel before spray painting dries the paint "from the inside out" in only 15 minutes

G&W Potheads

Recognized standard of the industry since 1905

- Seal cable ends against entrance of moisture which would seriously damage the cable insulation.
- Provide a compartment for surrounding the termination with insulating compound which improves the electrical strength over the surface of cable insulation.
- Seal cable ends against leakage of cable impregnating oil, loss of which would decrease the electrical strength of the insulation.
- Provide a neat support with means for conveniently making the conductor connections.

G & W offers stabilized designs of potheads for your own standardization, which minimizes your stock and simplifies your maintenance. Interchangeable parts are assembled in various combinations to take care of your different sizes and ratings of cables. Potheads of the correct type and size best suited to your requirements are shipped promptly.

Interchangeability of parts is illustrated by the five size "H" potheads shown. All five lids fit the five different shaped bodies. The base fittings all have the same size 4 flange. Porcelains and connectors are selected to meet the needs of voltage and conductor sizes. These size "H" potheads are only one of several groups which cover the full range of cables. Single conductor potheads are similarly assembled with interchangeable parts, many of which are identical with those for multiple conductor potheads.

Bulletin AB51 lists potheads in capnut, disconnecting and "through" styles, for all standard voltages and cable sizes. It includes part numbers and prices. Send for your copy.

G&W ELECTRIC SPECIALTY CO.
7780 Dante Avenue, Chicago 19, Illinois

Representatives in principal cities of U.S.A.
In Canada—Powerlite Devices, Ltd., Toronto, Montreal & Vancouver

A548

The Old Reliable

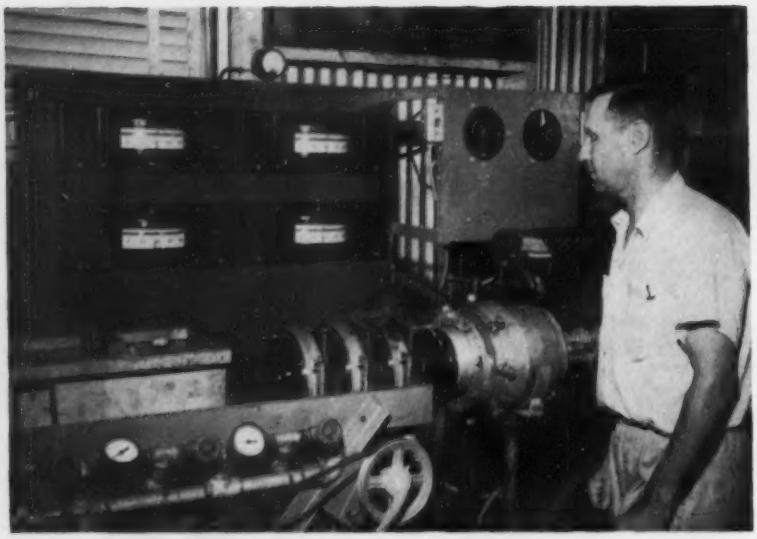
EVERSTICK ANCHORS...

EXTRA Holding Power
QUICKLY Installed
TOUGH For long life

● They speed up work and provide dependable anchorage in new construction and maintenance. Quick and easy to install—made of tough rust-resistant malleable iron—their holding power "tops" all others. Available two-way, three-way, four-way, and cone types. Write for facts.

AN EXCLUSIVE
EVERSTICK
FEATURE
Exclusive Everstick nut housing. Locks anchor firmly on rod. No chance of rod slipping thru anchor.

EVERSTICK ANCHOR CO.
Manufacturer of "THE ANCHOR OF MERIT"
FAIRFIELD, IOWA



ACCURATE CONTROL of extruded plastic is assured by electric strip heaters in making plastic pipe of uniform diameter and wall thickness. Thermostatic controls are provided at four separate points to give visual check of operating conditions

Heaters Provide Precise Plastic Control

J. M. JENNINGS, JR,
Industrial Representative, New Orleans Public Service Inc., New Orleans, La.

Electric strip heaters and thermostatic controls on a plastics extrusion machine at Dixie Plastics Division of Marine Controls Laboratory, New Orleans, La., provide accurate control of plastic viscosity to produce pipe of uniform diameter and wall thickness and free from surface imperfections. Space limitations were also a factor in the selection of the electric heaters.

Plastic granules, such as polyethylene, stryene, polyvinylchloride, or tenite are fed from a hopper (upper left in picture) then softened by 12 kw of strip heaters which encircle a short conveyor. The softened pellets are then forced out through the extrusion head which employs 3.4 kw to bring the plastic up to the optimum temperature of 400 F. Thermostatic controls are provided at four separate points and are connected to four temperature indicators which provide a visual check of operating conditions. Pipe is extruded in diameters ranging from one-half to six inches. Lengths can be varied.

Oven Speeds Production

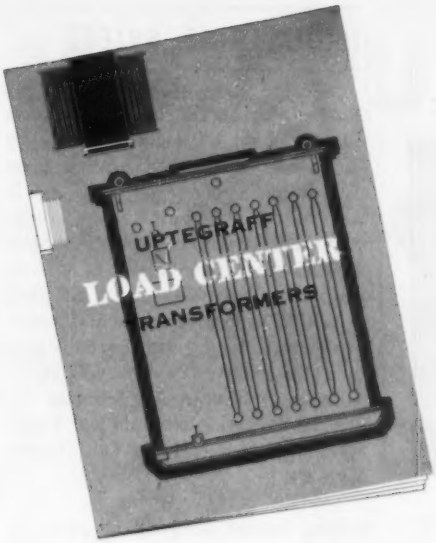
Drying concrete in steel molds in an infrared oven at the Kolb Refractories Co, Philadelphia, has cut to one sixth the in-mold time and greatly reduced the mold investment and floor space required for drying.

Rush orders can now be handled on a production basis, and the better and uniform product has made it possible to produce intricate molds thought impossible before the electric drying method was introduced.

The oven which is rated at 28 kw dries the concrete in 20 minutes. The radiant heat penetrates the 10-gage steel molds and the wet cement (often as thick as 3½ in.). Molds can be taken off in 15 minutes or less. W. B. Kolb, Kolb Refractories Co, Philadelphia, Pa.

Mending Costs Reduced

Conditioning hosiery with a 4-kw hosiery conditioner has cut the expense of mending by reducing the handling of the product at the Conestoga Knitting Mill, Mt. Joy, Pa. The firm, which had originally thought its operation to be too small to warrant such a unit, also found that no day-to-day adjustments are required. Maintenance costs are low. Jack Bidding, Industrial Power Representative, Pennsylvania Power & Light Co, Lancaster, Pa.



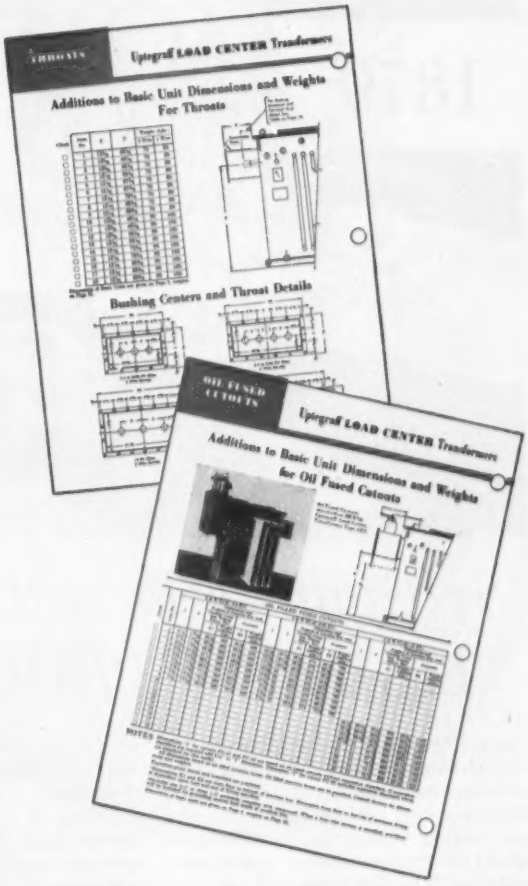
Uptegraff Announces a complete series of

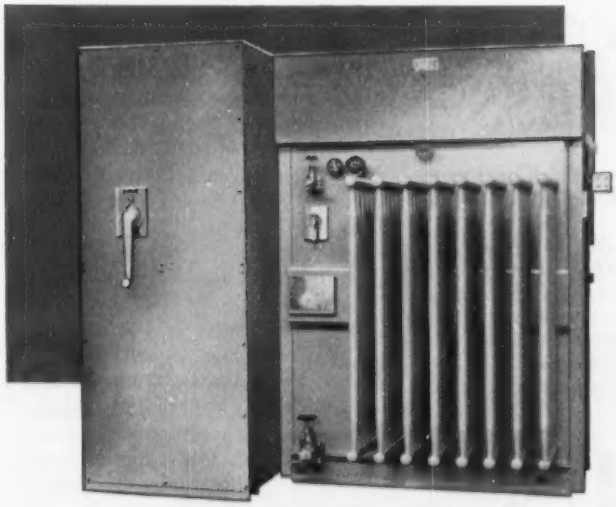
LOAD CENTER TRANSFORMERS

(150-2500 KVA)

Uptegraff announces a new series of *Liquid Filled* Load Center Transformers, made in eighteen ratings, from 150 to 2500 KVA., 3-phase. Designs are based upon extensive experience with this type of transformer, and represent modern engineering and manufacturing practice.

To simplify the selection and arrangement of auxiliary equipment, we have prepared a unique brochure, some pages of which are shown here. With this brochure, you can readily determine overall dimensions, total weights and other information for any combination of the Basic Transformer Unit with various types of switches and accessories. A check system permits the easy and accurate locating of desired data pertaining to various arrangements of properly rated equipment for any selected basic unit. We will be glad to send you a copy, free.


THROATS
Uptegraff LOAD CENTER Transformers
Additions to Basic Unit Dimensions and Weights For Throats
Bushing Centers and Throat Details
OIL FUSED CUTOUTS
Uptegraff LOAD CENTER Transformers
Additions to Basic Unit Dimensions and Weights for Oil Fused Cutouts



R. E. Uptegraff Manufacturing Co.
Scottdale, Pennsylvania

Send for a free copy of this 20-page data book, giving important and useful information on Uptegraff Load Center Transformers. Fill out and mail the coupon below.

R. E. Uptegraff Manufacturing Company
Scottdale, Pennsylvania

Please send a copy of your LOAD CENTER TRANSFORMER brochure, Catalog 132, to:

Name_____ Position_____

Company_____

Address_____

EW-10

During this Diamond Jubilee of Light...

1879 1954

Sylvania seeks still greater LIGHTING PROGRESS

Since 1901, Sylvania has pioneered in the development and improvement of incandescent lighting. Year by year, improvements in materials, methods, and testing techniques have brought about the Sylvania bulbs, well known today as "The Best Light in Sight."

In 1939, Sylvania introduced its first fluorescent lamp. And again, continuous laboratory research and improved methods have paid off in far superior products . . . lamps which give more lumens of light per dollar throughout their life.

Today, at the 75th anniversary of electric light, Sylvania lighting engineers are working toward still greater achievements . . . endeavoring to bring more efficient, more economical light to homes, schools, commercial and industrial organizations throughout the world.

SYLVANIA

Sylvania Electric Products Inc. 1740 Broadway, N. Y. 19, N. Y.

In Canada: Sylvania Electric (Canada), Ltd., University Tower Bldg., St. Catherine St., Montreal, P. Q.

LIGHTING • RADIO • ELECTRONICS • TELEVISION

INDUSTRIAL BRIEFS

Baking varnish on dipped armatures for fractional horsepower motors by increasing its infrared heating units 52 kw has upped production 350% for Reeves Hoffman Corp, Carlisle, Pa, manufacturers of quartz crystals and auxiliary equipment. It is now possible to bake 900 pieces per shift at 200 F as compared to 200 pieces which was all that the concern's previous smaller oven could handle in the same length of time. Joe Mumma, Industrial Power Representative, Pennsylvania Power & Light Co, Harrisburg, Pa.

Baking enamel on flashlight cases in 30-kw electric oven at Hipwell Manufacturing Co, Pittsburgh, Pa., speeds production and provides uniform results. Employees handle the electric heating equipment with safety and confidence. Oven with motor driven fan, bakes colored enamel on 1500 large or 4000 small cases per hour. H. T. Hipwell, president of the firm, is especially well pleased with the high even temperature the oven maintains and the uniform results it assures. W. D. Braun, Industrial Representative, Duquesne Light Co, Pittsburgh, Pa.

Heating water with an 80-gal electric water heater, replacing hand-fired stove and boiler, has reduced operating costs, eliminated maintenance and fire hazard at Wilmot Engineering Co, White Haven, Pa. New 25-kw unit provides ample hot water automatically. It is used in spring, summer and autumn months when company's main boiler plant is shut down. Rollie Edmunds, Industrial Power Representative, Pennsylvania Power & Light Co, Wilkes-Barre, Pa.

Heating formica with tubular heating elements permits it to be bent into any shape desired. By being able to offer its customers many varied shapes, Pennwood Industries, Inc, Hatfield, Pa., has greatly increased its business. The firm had the problem of forming material into suitable shapes for countertops, etc, but heat from two 7,500-w elements, placed end to end in a jig, now quickly makes the formica pliable and easy to use. Ken Orben, Industrial Power Representative, Pennsylvania Power & Light Co, Main Street, Bethlehem, Pa.

MOISTURE is Permanently SEALED OUT of Liner in BLACKBURN Parallel Groove CLAMPS

NEW PROCESS ELIMINATES USE OF SOLDER
Aluminum body is pressure cast around pronged copper liner—no moisture trapping voids or corrosive fluxes between liner and body to foster galvanic corrosion.

HIGH CONDUCTIVITY
Special surface treatment of under side of copper liner reduces surface tension of the molten aluminum —establishing a low-resistance contact between the two metals.

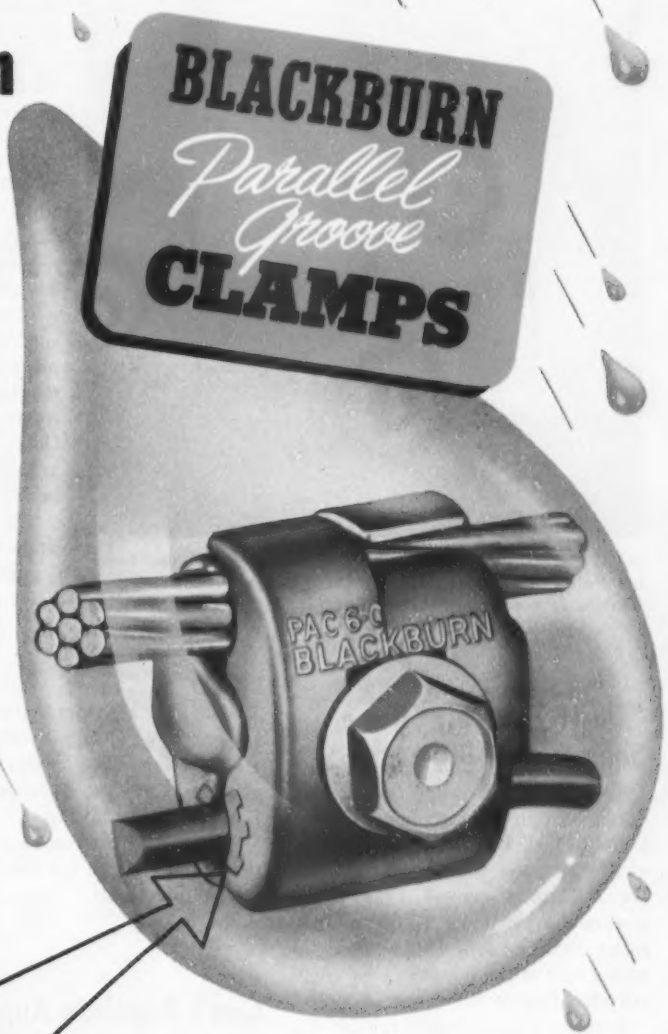
CORROSION RESISTANT
Aluminum bodies are cast of a highly corrosion-resistant alloy. The steel bolt, nut and lockwasher are hot dipped galvanized. Also available with aluminum hardware.

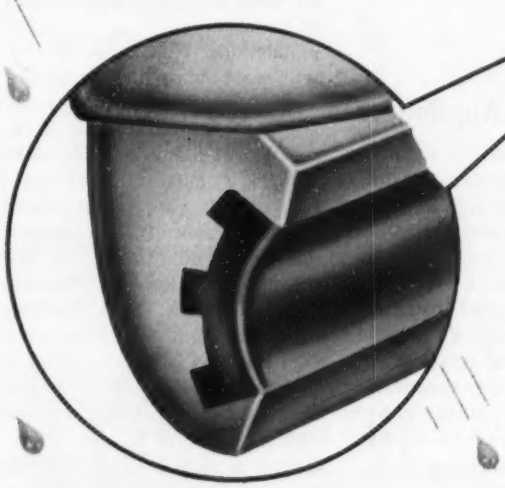
ONE PIECE CONSTRUCTION
No loose parts to assemble during installation—clamp bodies cannot be mated incorrectly—copper inserts always face each other.

Hexagon head steel bolt with square shank gives linemen option of using wrench on bolt head for tightening.

WITHSTANDS TEMPERATURE FLUCTUATIONS
Spring action of the design and extra-heavy lockwasher insures a permanently tight connection that will withstand temperature fluctuations.

AVAILABLE THROUGH ELECTRICAL WHOLESALERS EVERYWHERE





The molten aluminum has a coefficient of expansion 38% greater than that of the copper. As it shrinks in solidifying, great clamping force is exerted against the copper establishing an air-proof, moisture-proof joint. Because operating temperatures never approach the heat of molten aluminum, this key-lock shrink-fit is permanently maintained.

JASPER BLACKBURN CORPORATION
35 Madison Street • St. Louis 6, Mo. • Phone MAin 1-2821

SALES & SERVICE

SIGNS PLUGGING health benefits helped Washington Water Power sell electric dishwashers in "Lucky Lady" campaign. Utility is now finishing up third promotion, one aimed at the home freezer market

"Big Switch" Ups Sales 9.8%

"White goods sales here are up—9.8% for the first five months over last year—in contrast to a 6% decline on a national scale."

This was Kinsey M. Robinson talking whose Washington Water Power Co is going all out to help dealers sell appliances in a year-long "Operation Big Switch" program (EW, May 31, p 150).

Right now WWP is finishing up its third campaign of the year—a "Freez'n Save" promotion which aims to sell some 8,395 electrical household appliances. The "Freez'n Save" effort shoots particularly hard at the home freezer market. It relies heavily on demonstrations by WWP home economists and dealer displays which feature "Freezer Freddy", a fur-clad Eskimo. One Potlatch, Ida., dealer said he traced eight sales to the economist who appeared there recently before 60 housewives. Economists also are featured on TV spots.

"Freez'n Save" follows on the heels of last spring's successful "Lucky Lady" campaign in which 4,789 appliances were sold in three months. Lucky Ladies were the eight winners of dishwashers among the 3,200 entrants in a company-sponsored weather-guessing contest. Only dealers had entry blanks. Resulting traffice brought a 26% increase in dishwasher sales over the same period in 1953.

The company is now readying a "Mothers Helper" campaign which will run during the last quarter of the year. Quotas call for the sale of 2,300 automatic electric washers and 2,400 clothes dryers.

"Do-It-Yourself" Rage Seen As Wiring Menace

Worried about what it calls the "do-it-yourself wiring menace," National Electric Products Corp has initiated a program to combat the practice. Cartoon posters (75¢ each) and newspaper mats (35¢ and 45c each) depicting folly of do-your-own-wiring idea plus a booklet (3½¢ each) are offered by the company. Address: 2 Gateway Center, Pittsburgh 22, Pa. Company contends electrical wiring is job for the electrician, not the layman. "This 'do-it-yourself' advice," it says, "if allowed to continue will increase the screwball 'octopus' layman wiring in homes. It will create unsafe conditions, further stifle sale of appliances and kilowatt-hour load."

Two lines of action are suggested to combat the menace:

1. Carry the story of the dangers of "do-it-yourself" electrical wiring directly to the public;

2. Have the contracting industry initiate local activities that will remove the incentive of "do-it-yourself" electrical wiring—that is, do a complete electrical job so that the public won't have to help themselves.

Use of the cartoons and booklets, the company feels, are two good steps in this direction.

Can't Regulate Appliances

Arkansas Public Service Commission has ruled that it has no authority to regulate the sale of appliances by utility firms. Matter came up before the commission when the Associated Mechanical Contractors of Arkansas filed a complaint against Arkansas Louisiana Gas Co charging that sale of air conditioners and refrigeration units by the gas company constitutes unfair competition to private enterprise from a protected monopoly. Commission ordered dismissal of the complaint.

Fluorescent Street Lights Get Going

More than 800 of its Form 206 fluorescent street lighting luminaires are reported by General Electric Co to be in use across the country. Nearly the same number is on order but not yet installed.

Statesville, N. C., has 104 of the flourescent units in operation and Algina, Ia., 100 on order. Sizable numbers also are in use in larger cities like St. Louis, Seattle and Rochester, N. Y. Smaller installations (less than 10 units) are either already in service or planned by 30 communities, utilities and oil firms. Cities Service will light two service stations in Worcester, Mass., with fluorescents. In addition to these, there are over 100 luminaires being tried out in sample installations of one or two each.

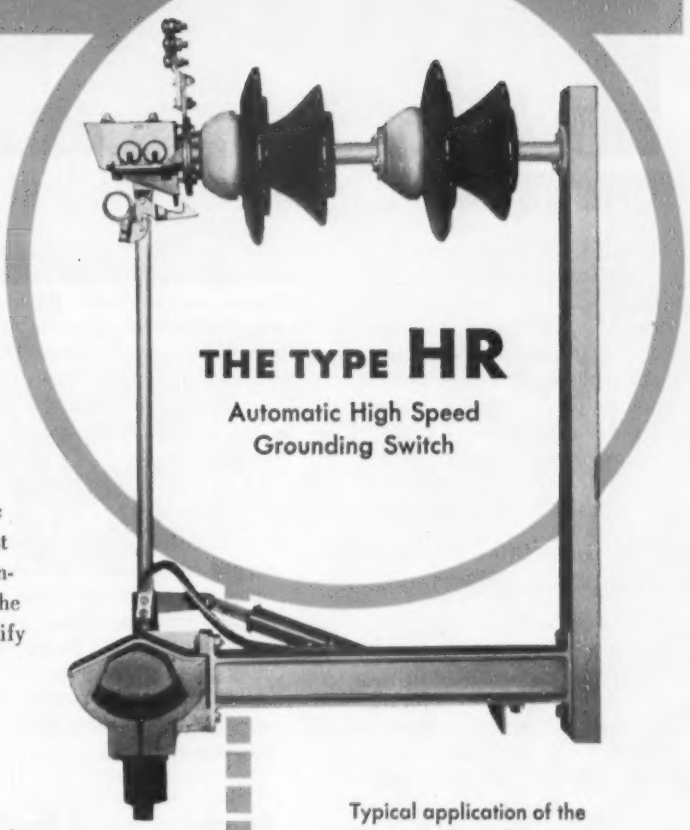
Figures also reflect several Canadian installations which have been or will be made at such locations as Toronto, Ont., and Halifax, N. S.

EXCLUSIVE! Hookstick operated

Automatic high speed grounding switch

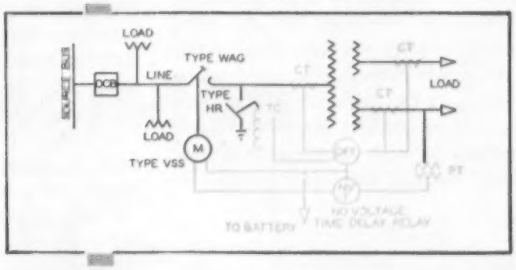
- **Mounts low for easy accessibility**
- **Eliminates costly circuit breakers**

Southern States alone makes an Automatic High Speed Short Circuiting Switch that is opened and reset by a hookstick. It is the Type HR, a complete unit with spring power integrally contained. The Type HR can be mounted on most structures at a *low, accessible level* and is easily isolated for periodic testing. This switch is ideal to furnish low-cost protection that would otherwise require expensive circuit breaker installations. Check all the features and see why it will pay you to specify Southern States Type HR switches.



- Hookstick operated
- Simple and easy to install
- Guaranteed operating time within 30 cycles
- Available in voltage ratings from 34.5 kv to 161 kv
- Momentary rating of 20,000 amperes and four second rating of 12,600 amperes
- Mounts on most structures
- Time tested and proved on nation-wide installations

Typical application of the Type HR. Control Circuits are shown in orange.



SOUTHERN STATES EQUIPMENT CORP.
HAMPTON, GEORGIA

CHG&E Lamp Competition Going Strong

More than 7,000 lamps—that is the total of entries in the annual award competitions among high school students staged by the Central Hudson Gas & Electric Corp in the past four years. Over 2,000 lamps were entered in the most recent one by students from 35 schools in the Corporation's service area. The lamps are constructed by the students from their own original designs. The picture shows the finals judges looking over the three grand prize lamps of the latest competition. They are, left to right, James H. Jensen, General Electric Co; Jan Reynolds, Sylvania Electric Products, Inc. and Walter H. Garrett, Westinghouse Electric Corp.

"Wire-Rama" to Re-wire Farm in Single Day

A Minnesota farmstead will be rewired in a single day in a special "Wire-Rama" event to be staged Oct. 8 by the North Central Electric League and Radio Station WCCO. Purpose will be to show how a farm wiring system, installed years ago, can be modernized safely and economically to meet present and future needs. The farm, located near Shakopee, is expected to draw thousands. Committee members include representatives from Northern States Power Co, rural cooperatives, educational groups, and all segments of the industry. Materials and labor will be contributed through cooperation of electrical manufacturers and contractors.

"Stacked Tube" Devised

A new and revolutionary concept of an electronic tube has been developed by Sylvania Electric Products, Inc. Called the "stacked tube," it is described as much more compact, rugged and durable than the conventional tube. The new tube features a ceramic envelope instead of the usual glass bulb. It is to be employed first in military applications and later in industrial and commercial electronic equipment, including radio and TV receivers.

Promotes Rural Products

With 75% of its rural customers engaged in dairying and sugar beet growing, Idaho Power Co has been helping them to promote their products. During National Dairy Month in June, 120,000 leaflets publicizing dairy foods were mailed with electric bills. An equal number, plugging beet sugar, were sent in July. Newspaper ads and office displays also were used. By promoting local agriculture, utility feels it helps entire area, including itself.

Other companies, like New York State Electric & Gas Corp., also have carried on similar campaigns (EW, Aug. 30, p 50).

S & S Shorts

Inspectors to Promote Week

"Do It Better—Do It Electrically" is theme of National Electrical Week to be sponsored by International Association of Electrical Inspectors concurrently with Light's Diamond Jubilee Week, Oct. 18-24. Promotional kits and display banners plugging observance may be had for $3.50 from Morgan Process Co, Inc, 5760 12th St, Detroit 8, Mich.

Saucers Push Sales

"Flying Saucers" was theme used by Cincinnati Gas & Electric Co in August to dramatize fact that electric dishwasher helps homemaker gain 200 extra leisure hours a year. An exhibit, featuring photos, models, tape recordings, and other documentary evidence of saucer sightings, was set up in company lobby. Waste disposers and water heaters also were promoted.

More Mercury-Vapor

An additional 170 mercury-vapor street lamps have been installed on 2.1 miles of main axial thoroughfares in Hartford, Conn. to complete this year's phase of the city's betterment program. Units have nominal rating of 20,000 lumens with 120-v multiple supply and pilot wire control.

New Products:

A full-size, automatic electric clothes dryer to sell at $149.95 has been introduced with the new '55 line of Norge appliances. Dryer is claimed to operate on plug-in 110-v current as well as usual 220-v supply, thus eliminating installation costs. Maker says unit at the lower voltage can dry eight lb of mixed clothing in less than two hr. Norge also offers five electric ranges which incorporate features requested specifically by homemakers.

Things to Write for:

Complete technical data on lamps for street and highway lighting are given in new 8-pg booklet offered by Westinghouse Electric Corp. Designed as a selection guide, booklet contains charts with data on mercury lamps and series and multiple type lamps. For copy write Lamp Division, Westinghouse Electric Corp, MacArthur Ave, Bloomfield, N. J.

3500 C for 30 Seconds

This Molded Current Transformer Meets Fire Test

Photo shows Type TWM current transformer after application of 3500 C for 30 seconds. The resin extinguished itself completely. Charring occurred to depth of 3/16 inch, but beneath this depth the resin was still solid.

ALLIS-CHALMERS **Instrument Transformers**

Allis-Chalmers thru-type molded current transformers can cause no fire hazard. Recent tests prove they will not support combustion or add to the intensity of a fire — an important thing to look for in a current transformer.

Hold More Conductors

Allis-Chalmers thru-type molded resin transformers hold more conductors than any other thru-type current transformer of corresponding rating now on the market. The oval window is large enough to hold two 500 MCM stranded conductors for any current rating in the 600-volt insulation class.

High Metering Accuracy

These transformers provide accuracy with the burden of one or more watthour meters. They are manufactured in four primary current ratings, with intermediate ratings available by passing the primary conductor through the window two or more times. Installation is simple and maintenance has been completely eliminated — no painting is required. Get complete facts from your nearby A-C office or write Allis-Chalmers, Milwaukee 1, Wisconsin, for Bulletin 61B8080. A-4385

ALLIS-CHALMERS

Outdoor current transformers, Type KO, rated up to 15 kv and 1800 amp.

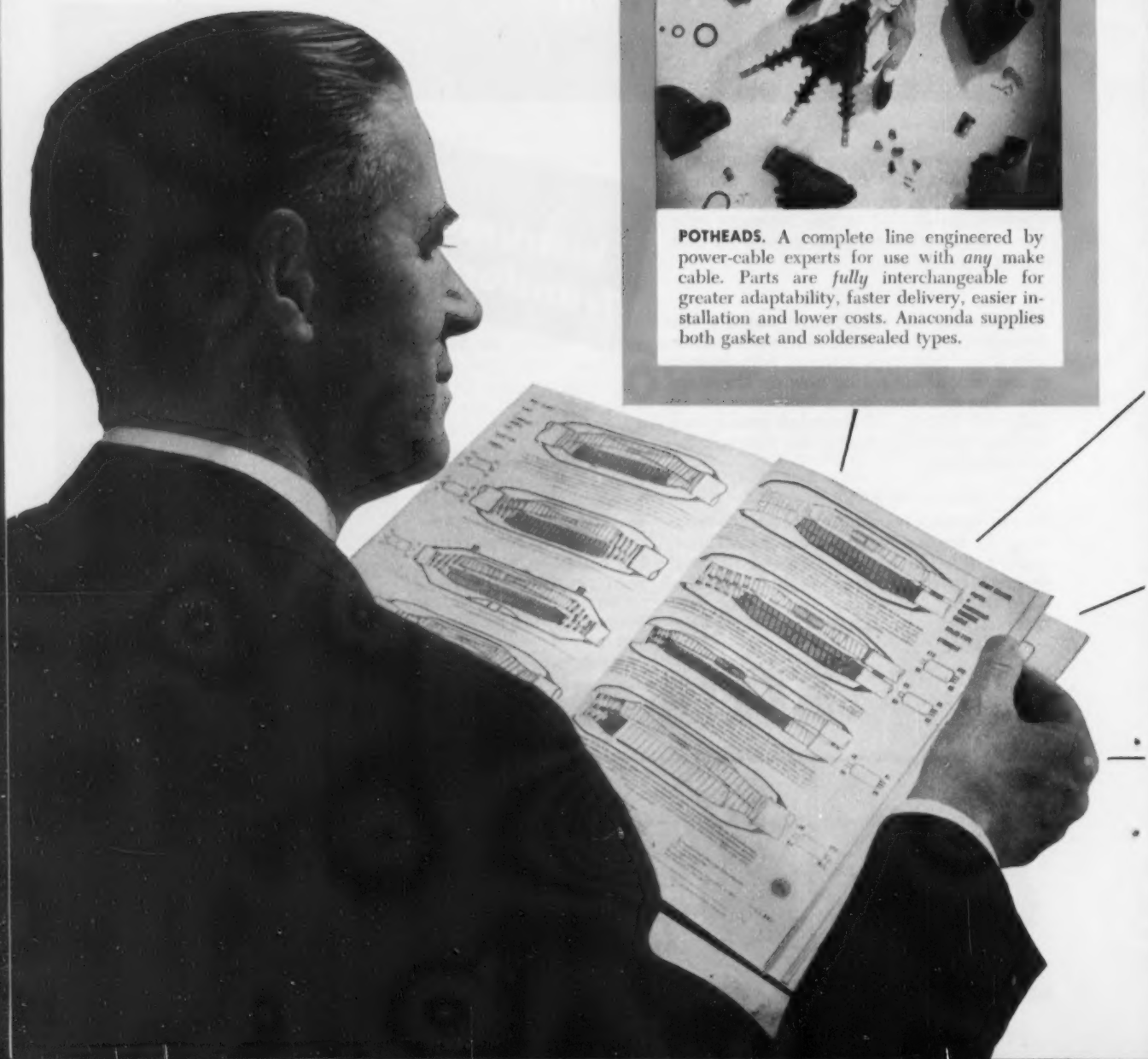
Indoor potential transformers, Type PD, rated up to 14,400 volts, 200 va, fused or unfused.

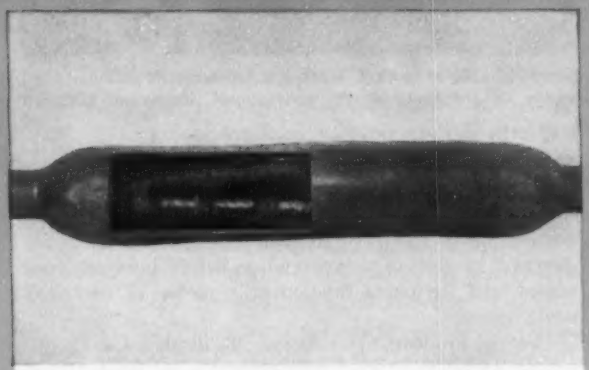
Outdoor potential transformers, Type PWD, rated up to 15 kv, 200 va.

Over 400 Types and Ratings

This New Anaconda Catalog Puts

The right cable accessory

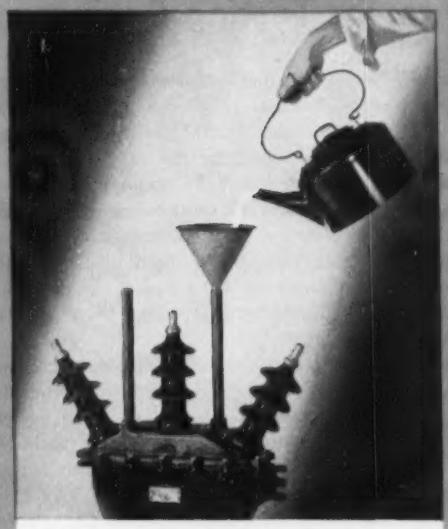
POTHEADS. A complete line engineered by power-cable experts for use with *any* make cable. Parts are *fully* interchangeable for greater adaptability, faster delivery, easier installation and lower costs. Anaconda supplies both gasket and soldersealed types.

...at your finger tips



F-3* ALLOY-LEAD JOINT SLEEVE. F-3 has higher tensile strength, lower creep rate, greater bursting strength, and higher resistance to bending fatigue and vibration. Furnished with jointing kit when specified.

*Reg. U. S. Pat. Off.

JOINTING KIT. Your cable-installation crews have everything needed new and clean for a specific joint. Materials are always on the spot. Never forgotten. Never left behind. Kits assure neat, lasting job.



FILLING COMPOUNDS. A group of compounds both plastic and fluid to meet every need: for paper-, varnished-cambric and rubber insulated cable joints and potheads for voltages up to and including 69kv.

Free —

Cable Accessories Catalog No. C-79-13-14. The most comprehensive book on cable accessories ever published. Simplifies selection and ordering of the right item for every job. A copy is yours for the asking. Write *Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.*

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ANACONDA®

where cable accessories are made by cable experts

First International Instrument Exhibition

SMALLER SIZE of Leeds & Northrup's Speedomax H indicator (left) points up the trend at the International Instrument Exhibition

Miniaturization of instruments, multipoint logging, and electronic computation were among the significant developments at the First International Instrument Congress and Exposition in Philadelphia, Pa, September 13-24. About 485 exhibitors displayed more than $10 million worth of automatic devices ranging from simple pressure gauges to complex computers.

Some of the manufacturers' developments of interest to electric utility personnel are:

Leeds & Northrup Co, Philadelphia, announced the Speedomax H indicator with 8-in. diam scale and a Series 60 automatic controller for measuring temperature, pressure and electrical conductivity. This is a packaged unit and needs only the same space as the Speedomax G indicator. A digital converter and adding machine was also exhibited.

Bristol Co, Waterbury, Conn, exhibited a preproduction model of a Dynamaster indicator for electrical values such as thermocouples. It has a 4-in. diam scale. The amplifier mechanism in a separate housing can be mounted on a rack. Another instrument, the Metagraphic recorder for telemetering, has a 3-in. strip chart.

Thomas A. Edison, Inc, West Orange, N. J. introduced the Omniguard temperature monitoring system. Its basic building-block design includes an indicator block and a 4-point monitor block. The monitor blocks can be added as needed, with the plug-in points increasing in multiples of four, each with an alarm.

Beckman Instruments Inc, Richmond, Calif, announced an analog computer. It has 14 rows of push buttons which allow the operator to set mathematical equations. When an error occurs in the problem, the computer stops.

Burroughs Corp, Paoli, Pa, exhibited a general-purpose, desk-size, electronic digital computer with an 11-column keyboard, and a storage capacity of 100 words of 12-digit lengths.

Electro Data Corp, Pasadena, Calif, announced a desk-type digital computer with 1,290 tubes and almost 3,000 germanium diodes. It remembers 10-digit "words."

Minneapolis-Honeywell Regulator Co. The company's Industrial Division at Philadelphia, Pa, has a power-type transistor that is reportedly capable of delivering up to 5 amp to a motor. The Micro Switch Division at Freeport, Ill, has a precision snap-action spdt switch with a length of 25/32 in. and a listing for 5 amp at 125 or 250 v, ac.

James G. Biddle Co, Philadelphia, Pa, exhibited a corona testing equipment for non-destructive evaluation of electrical insulation. Ratings are 20 kv, 7.5 kva continuous to 15 kva one-hour services. Another device shown was a portable motor and phase rotation tester. It determines the direction of electric motor rotation before lines are connected, and the phase rotation or sequence of energized power circuits.

Unistrut Products Co, Chicago, Ill, displayed a 1¼-in. square, 14-gauge channel with green enamel finish and it can be hot-dipped galvanized. Also shown were tubing clips to hold tubing, size ⅞ in. OD to 1 in. OD, to channels.

Automatic Switch Co, Orange, N. J. announced a new line of packless, two-way solenoid valves with forged-brass body and in pipe sizes ⅜ to 1 in. for 250 psi on air.

2 California Firms Sponsor Contactor Testing Equipment

Extended studies of the performance of high-current-density contactors now are possible with the development of a mobile, 200,000-amp, 29,000-kva testing transformer. The equipment was designed for the electrical engineering staff of California Institute of Technology by Dr. R. W. Sorenson of Caltech under the sponsorship of Cole Electric Co and Kelman Electric & Manufacturing Co. Portions of the equipment were contributed by Southern California Edison Co. The equipment will be made available to the electrical industry of southern California for other studies of high-current problems.

Dimensions of the complete test stand mounted on the trailer are 22 ft 3 in. bed length, 8 ft bed width; and overall height above road surface of 11 ft 4 in. Total weight is 23,500 lb, which is well within the 35,000-lb rating of the trailer. The transformer is specially braced to withstand road shock during transportation.

The test stand meets these requirements:

Primary side: Normally 16.5 kv at rated 29,000 kva, with connections to take supply at 18, 9, 8.25, 6, and 5.5 kv at rated capacity.

Secondary side: 200,000 amp at not less than 115 v for periods not exceeding 5 sec, with connections to provide up to 1,000 v and two other voltages at 6/7 of full rating.

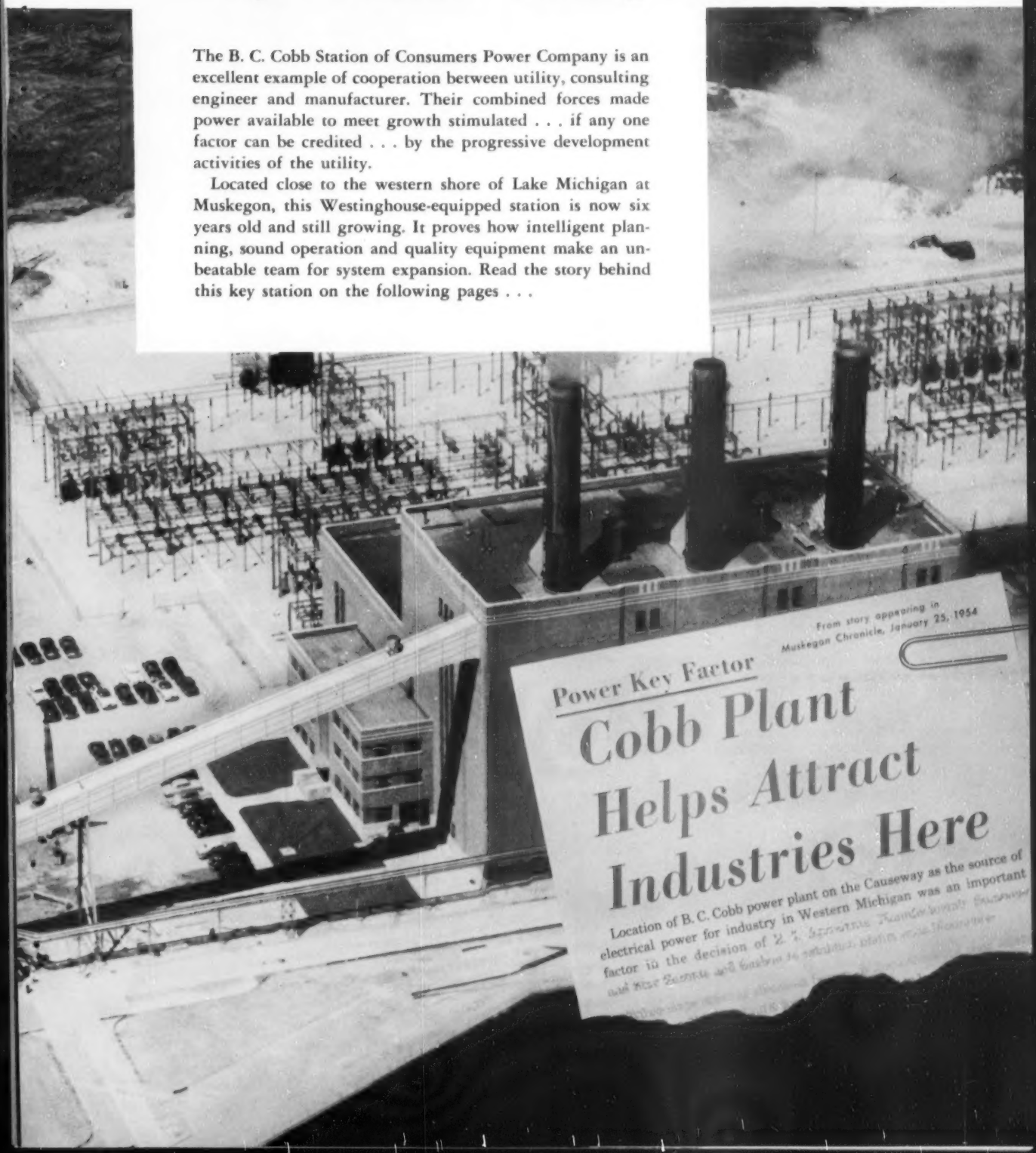
(*More M & M on page* 133)

CONSUMERS POWER REPORTS:

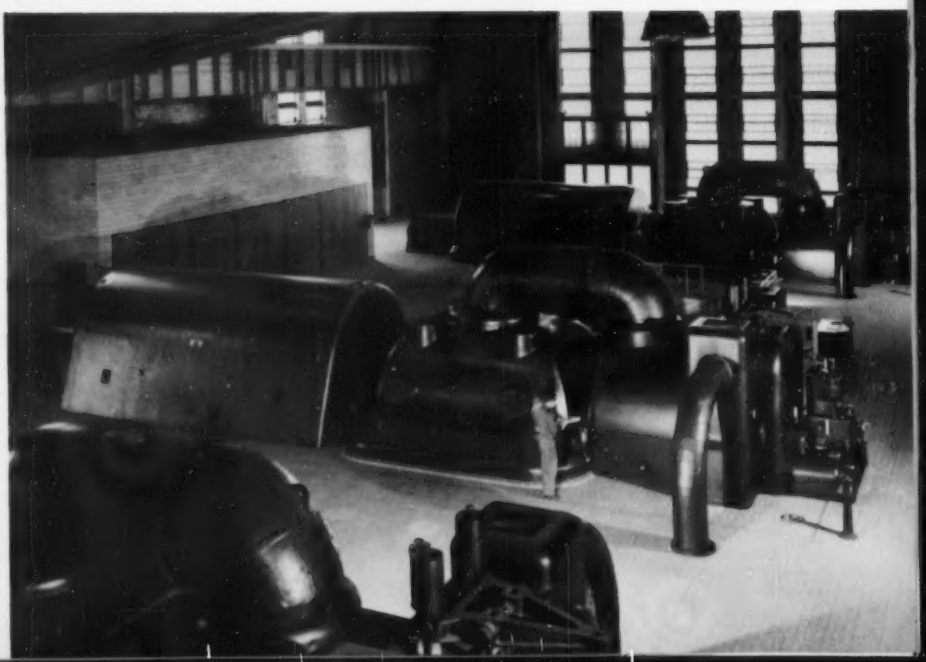
All-Westinghouse station helps outstate Michigan grow

The B. C. Cobb Station of Consumers Power Company is an excellent example of cooperation between utility, consulting engineer and manufacturer. Their combined forces made power available to meet growth stimulated . . . if any one factor can be credited . . . by the progressive development activities of the utility.

Located close to the western shore of Lake Michigan at Muskegon, this Westinghouse-equipped station is now six years old and still growing. It proves how intelligent planning, sound operation and quality equipment make an unbeatable team for system expansion. Read the story behind this key station on the following pages . . .


From story appearing in
Muskegon Chronicle, January 25, 1954
Power Key Factor
Cobb Plant
Helps Attract
Industries Here
Location of B. C. Cobb power plant on the Causeway as the source of
electrical power for industry in Western Michigan was an important
factor in the decision of

J. H. Campbell, vice-president, Consumers Power Co., (center) discusses turbine blading for Unit No. 4 — 156,250 kw — with J. E. Payne, Westinghouse vice-president, and W. S. Bovard, manager of the Jackson, Mich., office of Westinghouse. Cobb Station Units 1, 2 and 3 are shown at right.



Three-way cooperation put Cobb Station on the line on schedule . . . achieved economy in design and operation

The story of the B. C. Cobb plant goes well back into the history of the system, when the site at Muskegon was selected. The postwar potential of western Michigan dictated speed, but in early 1947 maintaining a construction schedule was a problem. Consumers Power and Commonwealth Associates found the answer in one supplier, one responsibility . . . and Westinghouse became the third partner.

W. S. Bovard, Westinghouse sales engineer, and now manager of the Westinghouse office in Jackson, went to work with the full facilities of his corporation. In addition to supplying and coordinating major equipment, Westinghouse followed through on small apparatus as well. The result: Complete standardization, with uniform reliability throughout the plant. Unit No. 1—66,000-kw nameplate, 70,425 guaranteed capability at 1.5″ Hg—went on the line for commercial operation in November, 1948.

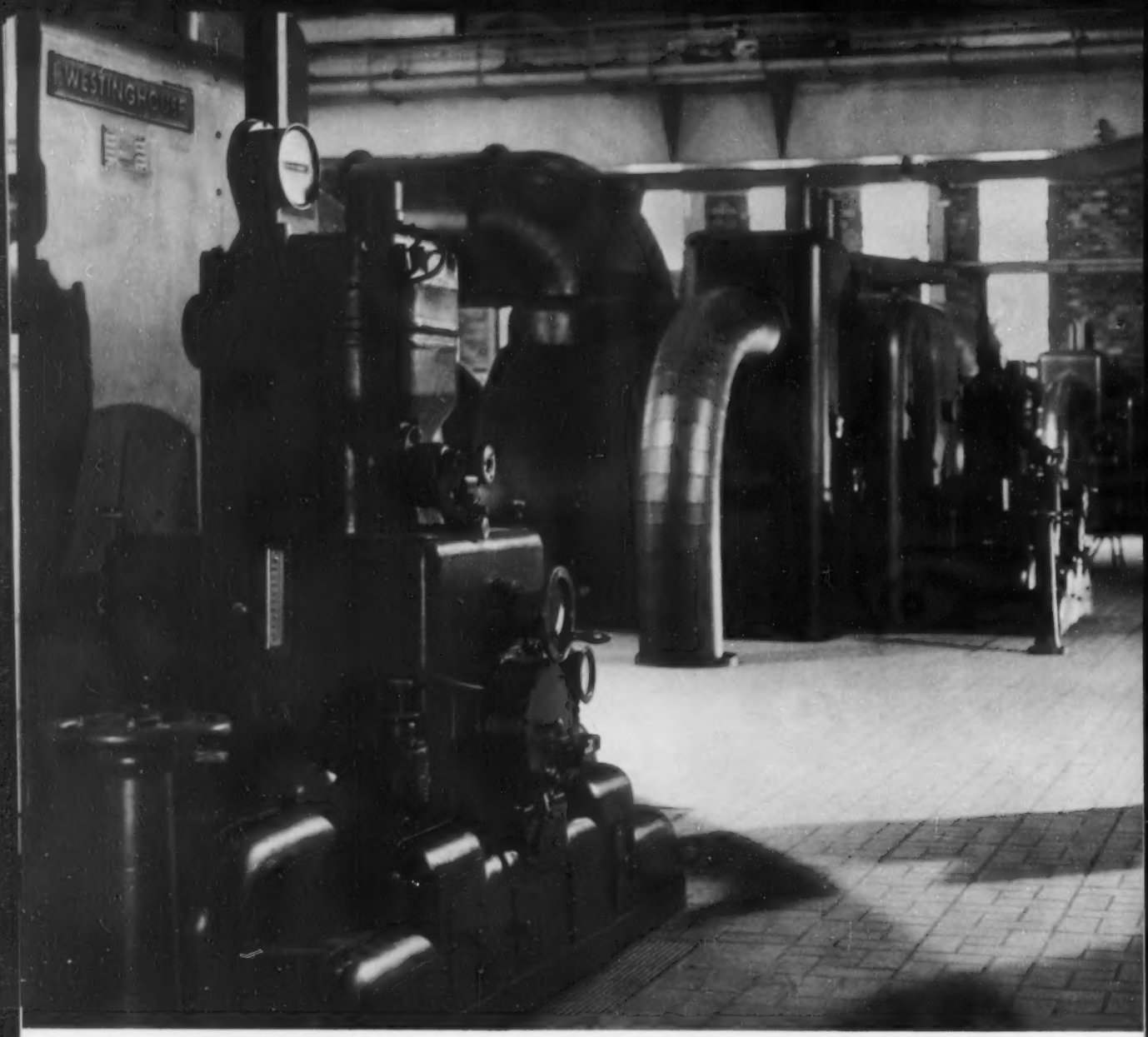
Cost per kilowatt $110.00
Heat rate holds firm

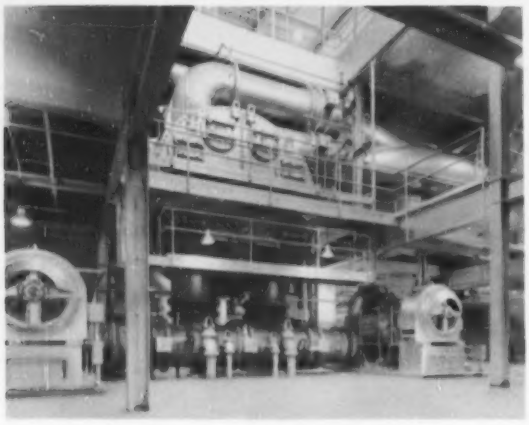
Two factors are largely responsible for this low cost and continued efficiency: Good planning and extensive use of standardized equipment. Cost proved out at $110.00 per guaranteed gross kilowatt, exclusive of substation . . . this in spite of unusual foundation expense which ran close to $5.00 per kw.

J. H. Foote, president of Commonwealth Associates, states that Cobb Station represents the most advanced design of its period . . . still turns out economical kilowatts in relation to plant investment. The heat rate holds a highly satisfactory average of about 11,300 Btu/net kwh. A total personnel of only 75 men (exclusive of coal-handling personnel) handles the 3-turbine plant on a round-the-clock basis.

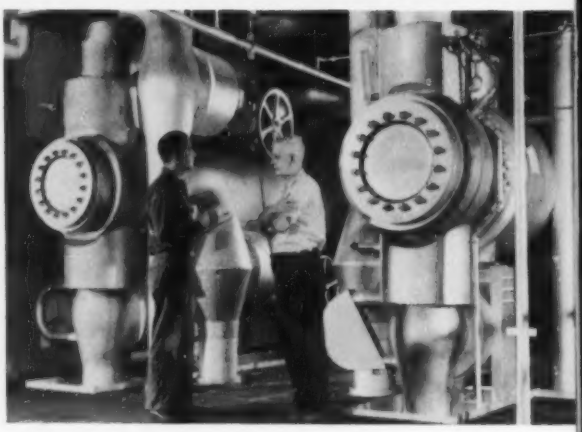
YOU CAN BE SURE...IF IT'S Westinghouse

Key men in the three-way cooperation which put Cobb Station on the line on schedule are C. E. Arvidson, vice-president, Consumers Power and J. H. Foote, president, Commonwealth Associates. With W. S. Bovard representing the third member of this successful team, they are discussing how reliable power from Cobb has become a key factor in supplying power for western Michigan.

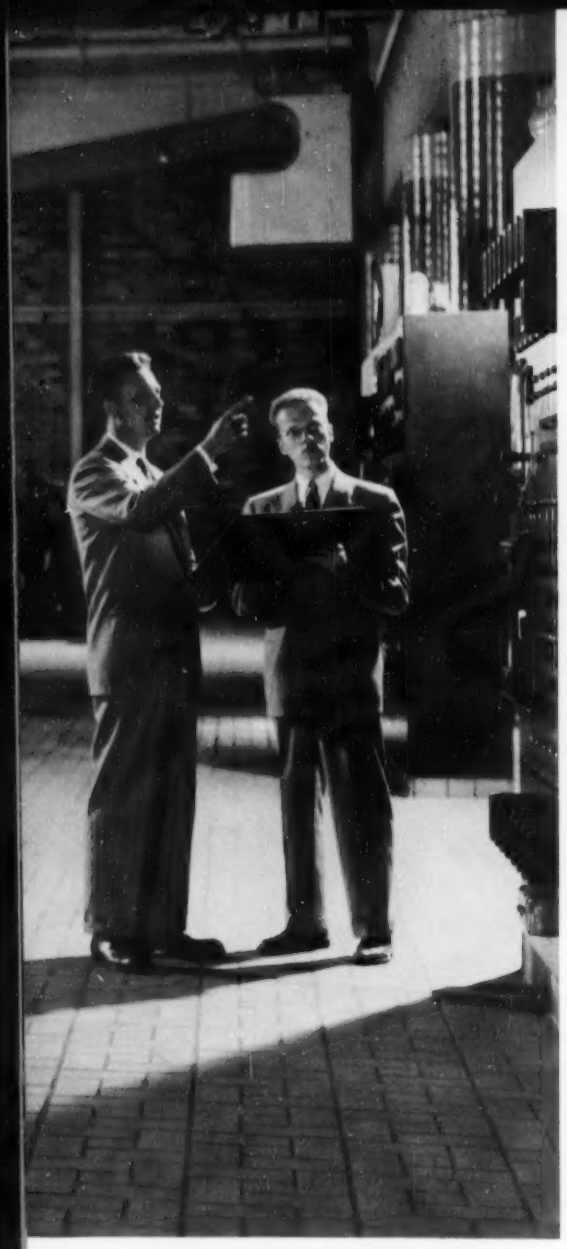




Westinghouse condenser performance has always been highly satisfactory. Free oxygen in the condensate holds consistently within guarantee values—contributing substantially to over-all plant efficiency. In fact, this performance has become their system criterion.



Clarence Medley, turbine operator, and Dennis Smallegange, mechanical maintenance supervisor, check feedwater heater temperature. There are four heaters: Two low, an intermediate and a high pressure. Mr. Smallegange reports, "No tube replacements or leakage."



The turbine-generators at Cobb have been notable for extremely smooth operation and highly efficient governing. While Plant Superintendent Ernie Palmer (left) was showing Dick Wilson, Westinghouse sales engineer, the operating log, one of the operators volunteered: "It's a pleasure to watch these governors work. They respond promptly and you hardly see them move."

Standardized apparatus

...best of current designs with proved performance, substantial savings

Extensive use of standardized equipment to attain maximum economy and speed construction is typified by the steam apparatus for B. C. Cobb Station. The three Westinghouse turbine-generators in the present station are all 66,000-kw ASME-AIEE Preferred Standard. They were among the very first preferred standards to be installed anywhere, and bore out the advantages of initial cost savings, faster delivery and easier installation.

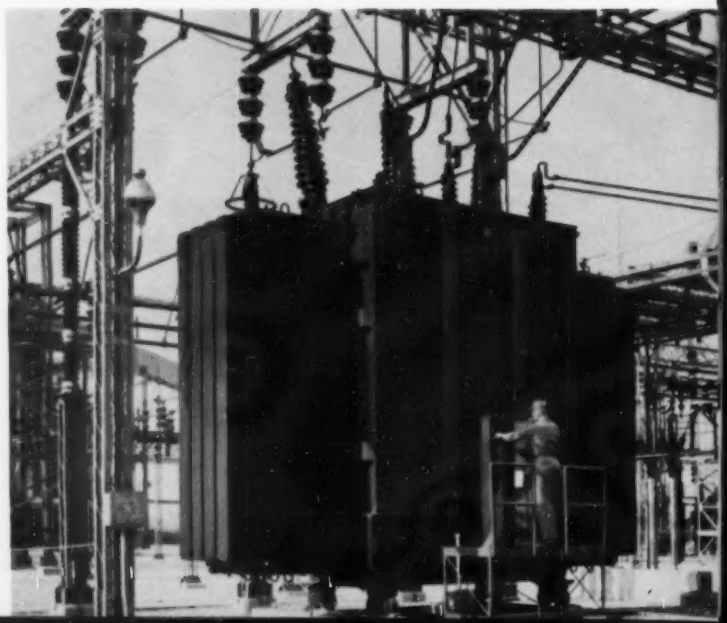
In 1956, still another Westinghouse turbine-generator will be added . . . this one a 156,250-kw guaranteed capability reheat design. With this installation, Cobb Station will have four Westinghouse units, each representing the best design of its day. Already, the three 66,000-kw units have established a fine record of reliability, being given preferred use on the system.

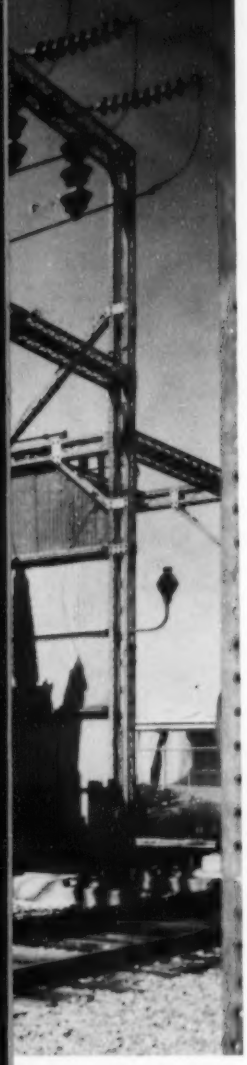
The same record for dependability has been established by the other Westinghouse steam apparatus. Condenser performance has become their system criterion, and the feedwater heater operation parallels the trouble-free operation of the other equipment. Feedwater heaters for Unit No. 4 will be the latest Westinghouse design; the high pressure heaters incorporating the exclusive quadrant head construction.

YOU CAN BE **SURE**...IF IT'S Westinghouse

At Cobb Station, "Form-Fit" design of the main power transformers allowed adequate space for side-by-side installation with the standardized station power transformers. Above, Dan Potter, electrical maintenance supervisor, and Joe Fordyce, Westinghouse Engineering and Service supervisor, review the performance record of the units, rated 75,000 kva and 6,000 kva.

Francis Geisler, assistant switchboard operator, checks the Inertaire® mechanism of this Westinghouse "Form-Fit" substation transformer, rated 30,000 kva, OA, installed in Cobb Switchyard.





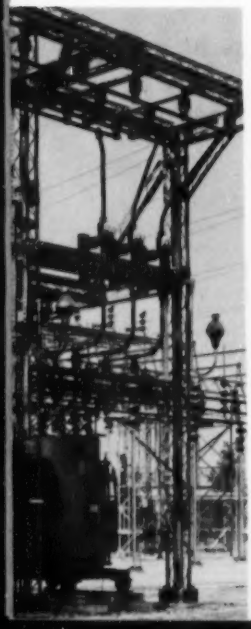
"Form-Fit" power transformers saved space...speeded installation

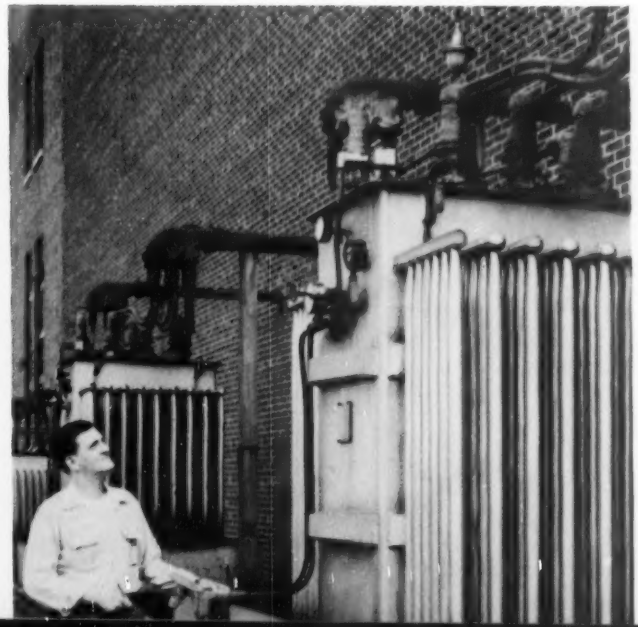
At Cobb Station, this story is legend: "When the first of these transformers came in here on its flatcar with radiators detached, it seemed too small to possibly be the capacity specified."

They referred to the three main power transformers, rated 75,000 kva, FOA. The extremely compact "Form-Fit" design made it possible for them to be delivered upright and, except for detachable radiators and bushings, in one piece. It also made possible installation outside the station wall in direct line with the turbines. Adequate space for installation of 6,000-kva standardized Westinghouse station power transformers was available between the main transformers.

Westinghouse "Form-Fit" power transformers consistently provide superior mechanical, thermal and dielectric properties with greater compactness than any other design. Westinghouse standardized transformers, core-form design, offer reliability with economy. Consumers Power, like many other utilities, has found Westinghouse three-phase power transformers so reliable that stand-by units are not required.

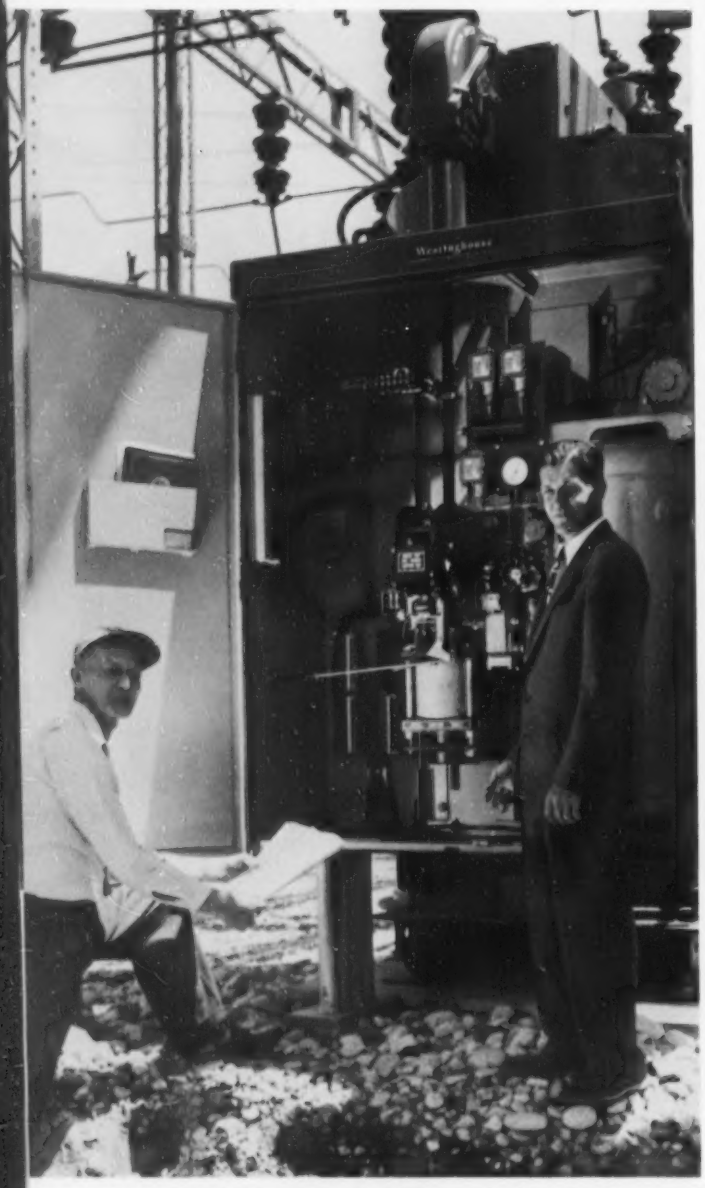
YOU CAN BE SURE...IF IT'S Westinghouse





Al Witham, assistant switchboard operator, inspects the Westinghouse "SL" 750-kva power transformers installed on the station roof. One of their own best customers, Cobb Station depends on these transformers to supply power for all 480-volt motors.

Six-year record of "trouble-free" operation proves quality of Westinghouse breakers

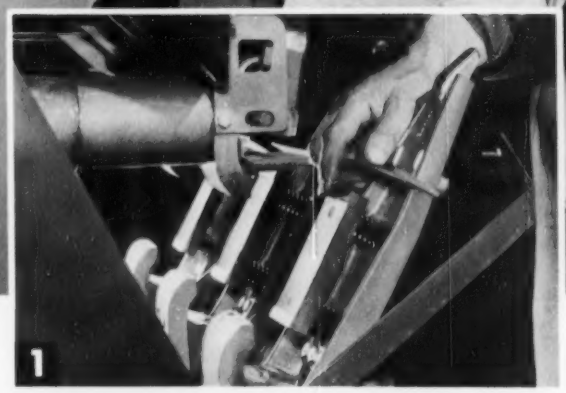


From the large-capacity, 138-kv switchyard breakers, down through the 480-volt, metal-enclosed switchgear, the breakers at Cobb Station have compiled an enviable record of trouble-free operation. In all six years of the station's history, they report only one problem: a bent stud on a contact of the 2400-volt switchgear serving the ash jet pumps . . . after the counter had recorded 18,573 operations! Because the drawout feature of the switchgear made it easy, the contact was quickly replaced. After the stud was straightened, it was returned to stock, good as new.

Dan Potter and Joe Fordyce are checking the diagram of the AA-10 pneumatic mechanism of a GM-5 power breaker rated 138,000 volts, 1200 amps. This breaker protects the transmission line to a new chemical plant. Potter is standing in the area excavated for the foundation of a new bank of Westinghouse GM-5's, to be installed.

Dick Wilson of Westinghouse and Roscoe Munch, shift supervisor, compare notes on the GM-4 breakers, 138 kv, 600 amperes. The consensus: "Once they're properly installed, these breakers are trouble-free pieces of equipment." Time and again that was expressed . . . the trouble-free operation proving quality of equipment better than any test.

YOU CAN BE **SURE**...IF IT'S

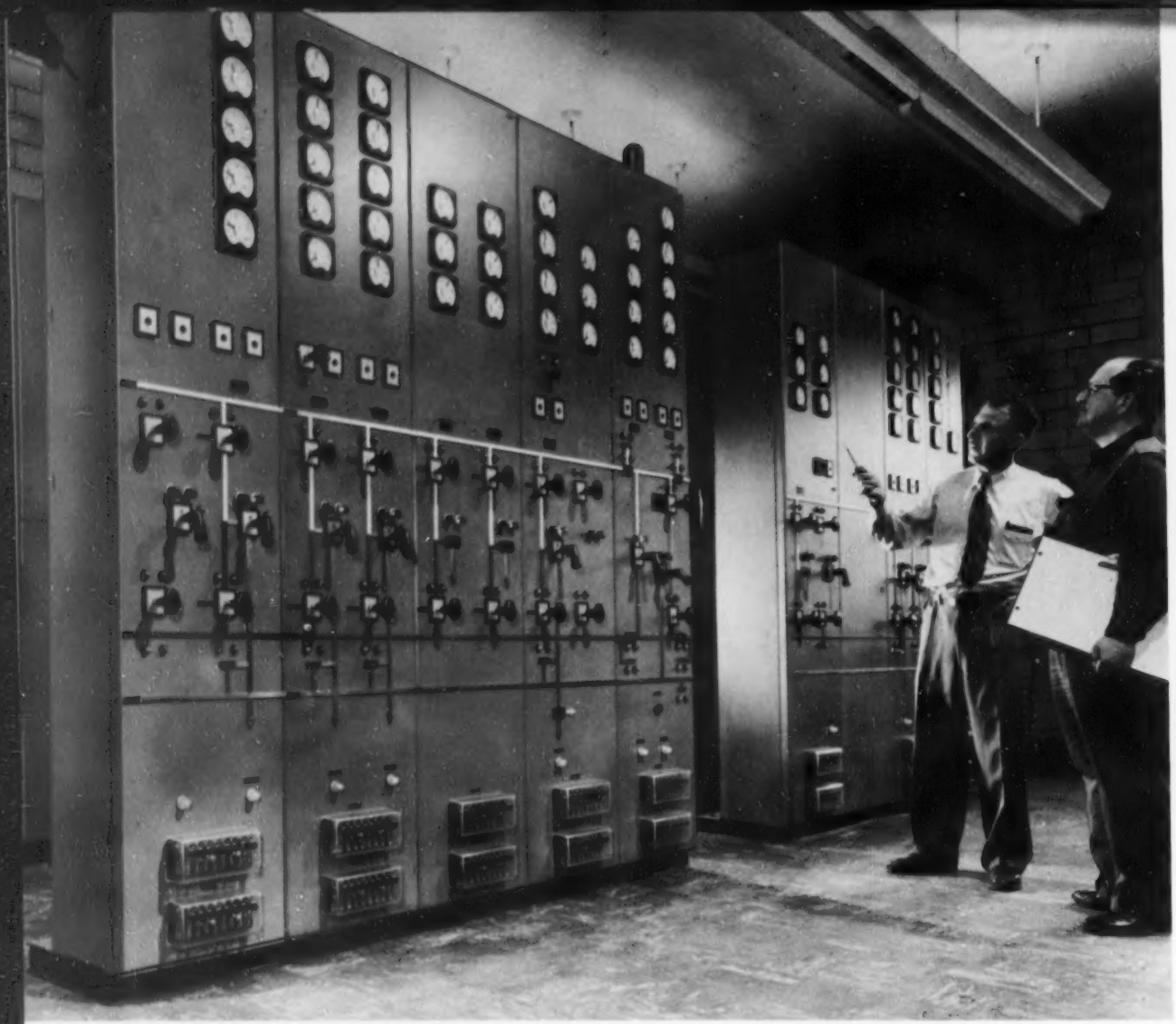


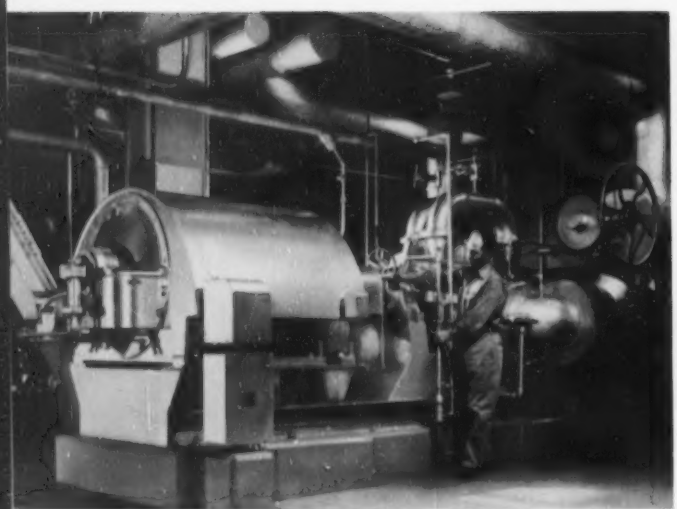
Dan Potter, electrical maintenance supervisor, shows how the drawout feature makes it easy for Gil Conroy to periodically check the 2400-volt breakers. This is the one breaker in the entire station that required service after 6 years and 18,573 operations.

Close-up of the breaker contacts in the 2400-volt switchgear. There are 34 breakers of this class in Cobb Station controlling and protecting the station's heavy electrical auxiliaries . . . with an enviable six-year record of trouble-free operation.

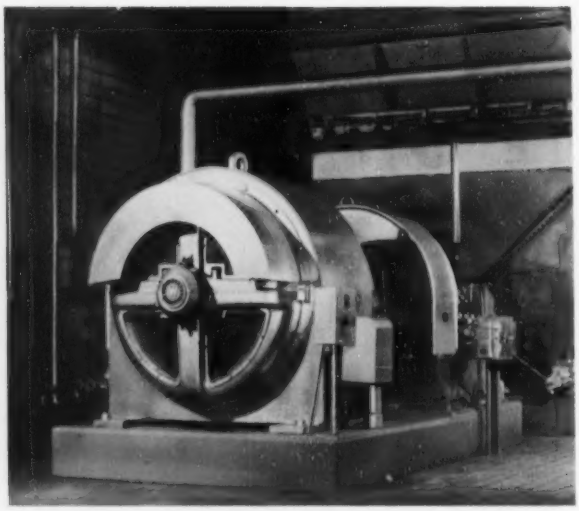
Here's the evidence. The damaged contact, left, had the stud straightened and was returned to stock, just as good as the new contact shown at right. Note the complete absence of pitting, burning or wear.

Westinghouse

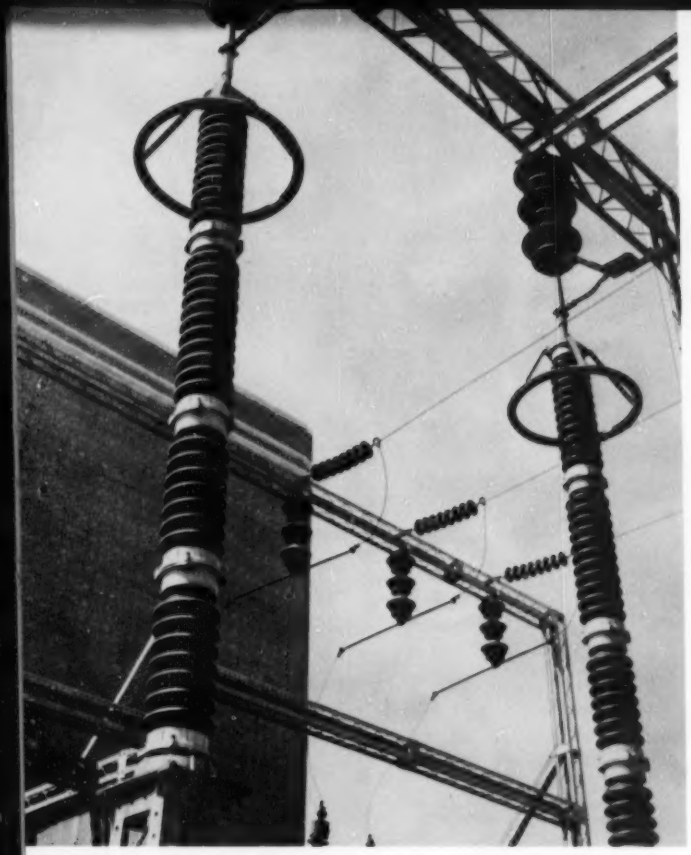




James McCann, assistant boiler operator, makes a routine check of bearing temperature on the Westinghouse 2300-volt, 1000-hp powerhouse motor, which operates one of the boiler feed pumps. All auxiliaries depend on Westinghouse motor drives.

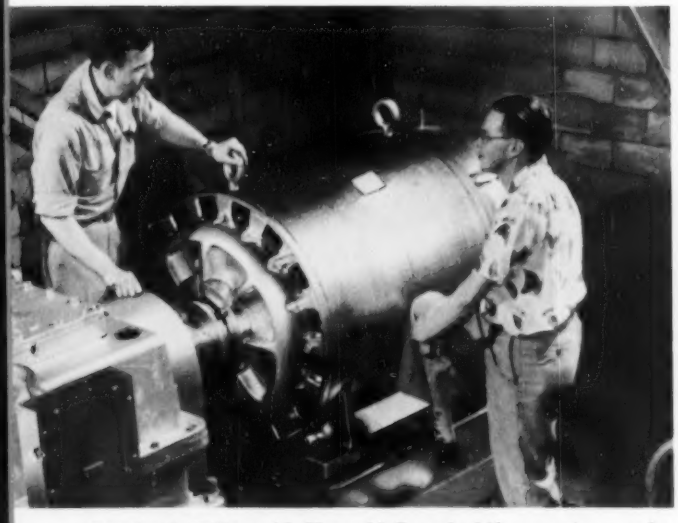


Induced draft drives. These standard 2300-volt, 1000-hp powerhouse motors were designed to operate in high ambient temperatures. This area of the plant averages 120 degrees . . . often gets up to 140 degrees F.



Westinghouse SV arresters. Six years on the line—no trouble whatsoever! How many surges? How large? The protection has been so perfect, there is no way to tell.

Ray Franks, shift supervisor, checks the electrical control panel with Alex Barringer. This installation was one of the first to use the new full-view Type K-24 circular scale instruments. Readings can be made at angles up to 65 degrees and without interference from glare with this widely accepted Westinghouse design.



Douglas J. Mullen with Harry McConnel, shift supervisor, at the 2300-volt, 200-hp induction motor in the coal house. This is an explosion-proof conveyer drive which lifts coal from the base of the pile to the bunkers, eight stories above.

Westinghouse reliability makes Cobb Station a top performer

Cobb Station has achieved its top performance through four prime factors: (1) Good utility—consultant planning; (2) Selection of standardized apparatus; (3) Westinghouse single source responsibility; and (4) Ability of Westinghouse equipment to meet or exceed all specifications.

Time and load growth have been a good test. To say that Cobb Station was put on the line without a "hitch" is unrealistic; but with a team of competent Westinghouse engineers on hand, every problem was handled promptly. The result: All three members of the team: Consumers Power, Commonwealth Associates and Westinghouse are proud of Cobb Station . . . prouder still of its dependable and efficient operation.

This record of Westinghouse apparatus is not unusual. But it does illustrate the extremely broad scope of products, the reliability of equipment and service, and the product engineering assistance which can help every utility in achieving the best possible performance and lowest possible cost in meeting their growing loads.

YOU CAN BE SURE... IF IT'S

Westinghouse

Still growing . . . Unit No. 4 scheduled for 1956

The planning of Consumers Power moves well in advance of the growth of outstate Michigan. With the addition of Unit No. 4, a 156,250-kw reheat unit and its 170,000-kva "Form-Fit" transformer, gross guaranteed capability at Cobb Station will be 367,525 kw—all Westinghouse.

The same cooperation which has made this station successful—utility, consultant and manufacturer—also helps them in their system planning. An Economic Loss Study, made on Westinghouse calculating facilities, is helping Consumers Power improve their operation and provide for automatic system load control.

In the photograph above, Emmett O'Meara, construction superintendent, shows Dick Wilson the technique of using watertight construction, then calculating the natural buoyancy of the plant to reduce the number of piles required for solid footing. Inset shows preliminary drawing of Cobb Station as it will appear when Unit No. 4 is completed.

Westinghouse sales engineers, at your service

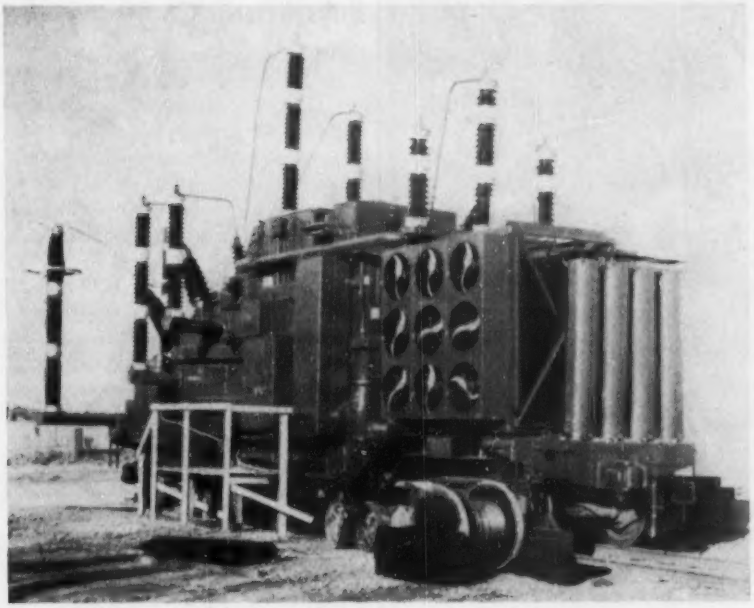
Men like Bill Bovard and Dick Wilson, who represent Westinghouse in the Consumers Power territory, are ready to serve you at any time . . . to help solve problems, get better equipment, or improve operations. Behind them are corporate facilities covering every aspect of your business, from fundamental research through manufacturing capability.

Call them at your local Westinghouse office, or write direct to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. CP-1024

YOU CAN BE SURE...IF IT'S

Westinghouse

(*M&M continued from page* 120)



50,000 Kva Transformer Mobilized

The Ohio Power Co, Canton, Ohio, purchased a mobile 50,000-kva, 3-phase autotransformer for emergency service. The transformer is mounted in a 25-ft long well of a 90-ton depressed-center flat car built by the Greenville Steel Car Co, of Greenville, Pa. A similar flat car unit was made for the Appalachian Electric Power Co, Roanoke, Va.

The 39-ft car has a load limit of 194,700 lb. After all equipment is mounted on the car the mobile unit is to be parked on a sidetrack at the power company's Rockhill Station, Lima, Ohio. It will be placed in service this fall to give increased capacity for Lima pending substation expansion.

Federal Pacific Buys Gardner Electric

Federal Pacific Electric Co, Newark, N. J., has acquired the Gardner Electric Manufacturing Co, San Francisco. Acquisition of this transformer company is expected to increase sales and improve the company's competitive position, according to Thomas M. Cole, executive vice president. As transformers are often sold as an integral part of switchgear equipment, expansion into transformer manufacturing is a natural development, he added.

Gardner is reported to have been purchased for $426,000. The plant is at Emoryville, Calif., has 36,000 sq ft area, and was built in 1947.

MANUFACTURERS' EARNINGS

Company	Period Months Ended			Net Income 1954	Net Income 1953	Earnings Per Common Share 1954	Earnings Per Common Share 1953
American Chain & Cable	6	June	30	$1,633,596	$2,607,779	$1.55	$2.46
Baltimore & Ohio R.R.	7	July	31	8,384,990	15,774,947	.....	.....
Chicago Pneumatic Tool	6	June	30	2,652,621	2,547,245	5.24	5.12
Cornell-Dubilier Electric	9	June	30	1,012,000	1,258,000	1.88	2.35
I-T-E Circuit Breaker	6	June	30	1,025,155	1,237,255	0.95	1.18(b)
Kaiser Alum & Chem	12	May	31	14,015,715	11,767,897	3.36	2.86
Philco Corp.	6	June	30	1,735,000	12,216,000(p)	0.41	3.19(b)
Sangamo Electric	6	June	30	870,983	1,186,714	1.24(t)	1.70(t)
West Va. Pulp & Paper	9	July	31	9,138,000	9,812,000	1.79	1.93
Weston Elect'l Instrument	6	July	2	654,104	647,112	1.53	1.51

Note—(b) Based on shares now outstanding. (p) Includes non-recurring income of $5,283,000 equal to $1.40 a common share. (t) On 700,000 shares outstanding June 30, 1953 and 1954. (Additional 100,000 shares sold in July 1954 making a total of 800,000.)

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MAN HOURS HAULING BURNING

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LOW-COST BRUSH DISPOSAL

Read how leading tree surgeons, power companies, municipalities, utilities use Fitchburg Chippers to cut disposal costs up to 50%—create customer good will.

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Dept. 1610, Fitchburg, Massachusetts
Send me the New Chipper Booklet!

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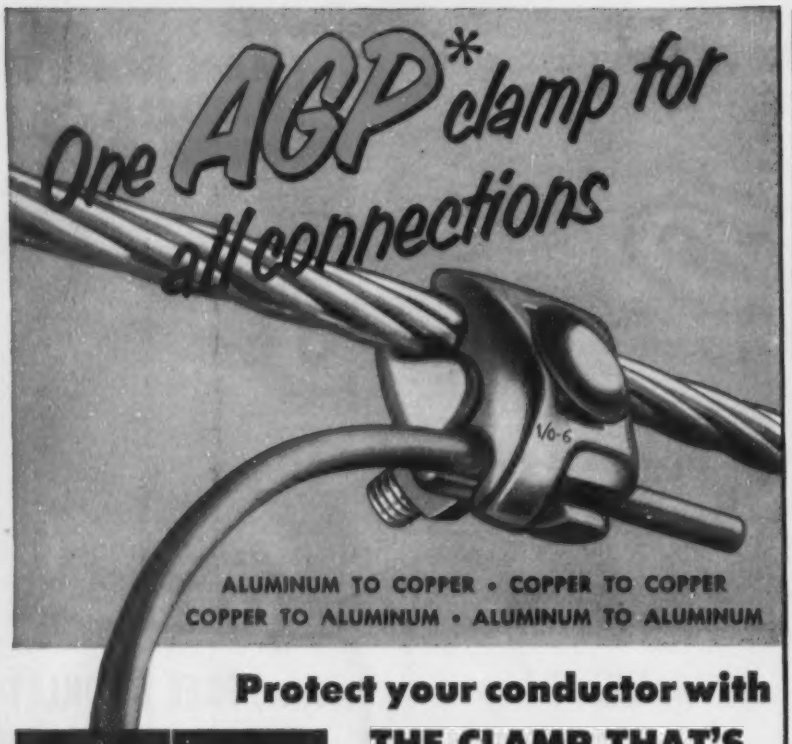
*Address*_____

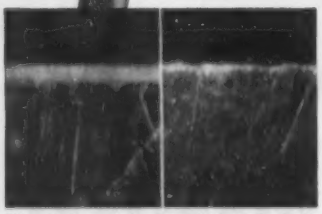
*City*_____

*State*_____

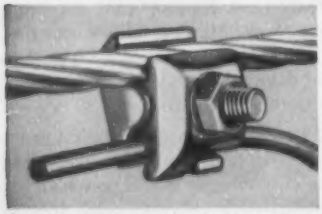


Protect your conductor with

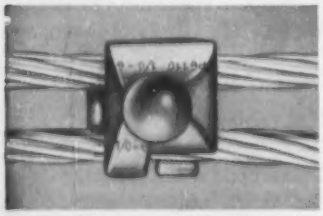
THE CLAMP THAT'S AHEAD OF THE TREND



Micro-photograph shows how high-density fortified cadmium, applied to a thickness of .001" on Chance AGP Clamps, compares with commercial plating at right.



Overlapping contacts on one side and a straight slide-in groove on the other help the attachment of the tap to the line.



Top view of clamp shows extra wide gripping jaws that contact all outside conductor strands in the entire size range.

Connecting copper and aluminum conductor requires a general purpose connector as good as the conductor itself in conductivity, mechanical stability and corrosion resistance, if future trouble on the line is to be avoided.

The best connector for this purpose is an aluminum bodied clamp with a *properly applied coating* of high density, fortified cadmium, proved best by every test for long-lasting, troublefree, general purpose connections.

That's what you get in the New Chance AGP Parallel Groove Clamp, companion to the widely tested and accepted Chance AGP Tap Clamp. The Chance PG110, shown above, can be used for any combination of aluminum or copper in a size range 1/0 ACSR to No. 6 copper *both sides.* This clamp is heavy in construction—yet light in weight. The high tensile strength bolt swivels into position without binding or bending. The wide jaws of this clamp contact every strand of any conductor in the entire size range. Rounded edges protect the conductor against damage from vibration.

Chance PG110 is your universal clamp for most applications. Larger sizes with the same features are also available. Write for complete information.

*Aluminum General Purpose

A·B·CHANCE CO·

CENTRALIA, MISSOURI

SAN FRANCISCO, CALIFORNIA

American Chain & Cable Buys Bristol Co

Bristol Co, Waterbury, Conn., has been purchased by American Chain & Cable Co, Inc, of Bridgeport, Conn. Purchase of virtually all of the 194,800 shares of outstanding stock amounted to about $7.6 million, or approximately book value for all of Bristol's American and Canadian holdings.

Bristol Co maintains 27 branch offices, branch factories in Chicago and San Francisco, and has a Canadian subsidiary. No changes in management, personnel, or policy are contemplated. The company was founded in 1889. Principal products are industrial instruments.

CABRA Predicts Ample Copper

Copper supplies in the United States will meet all requirements, and the metal can be used without restrictions. This assurance was given American industry by speakers at a recent news conference sponsored by the Copper and Brass Research Association (CABRA) in New York City. This assurance is based on uninterrupted mining and refining and on the assumption that no emergency conditions will arise.

"Industry can look forward with confidence to copper being available in ever-increasing quantities," said William A. Meissner, Jr, deputy director of the copper division of the Business and Defense Services Administration, Department of Commerce. He continued, "Engineers and designers may specify copper for new products with the assurance that copper supplies will keep pace with an expanding market."

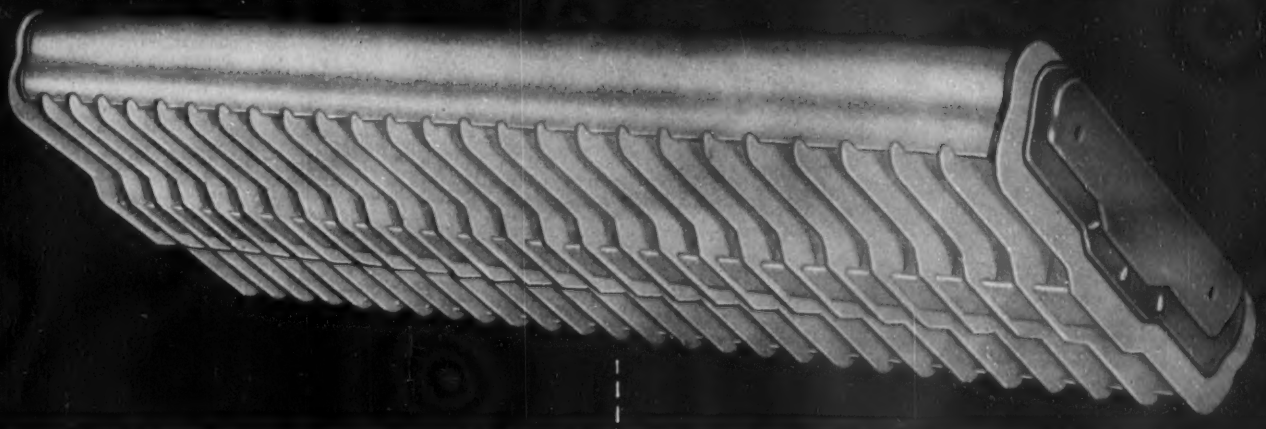
A new booklet, entitled "Copper Today and Tomorrow," published by CABRA, Meissner explained, "presents many of the facts on which the optimism about future abundant supplies of copper is based."

At the meeting Theodore Veltfort, manager of CABRA, announced an expanded program of research, advertising, and general publicity to acquaint the public with the applications of copper and its alloys. Members of the association will participate in the program. They represent 90% of the nation's copper and brass fabricators.

Flexibility PLUS

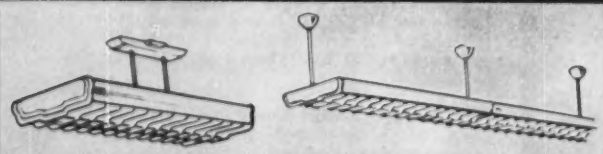
FOR TODAYS MOST EFFICIENT COMMERCIAL LIGHTING

Wheeler FLO-LINER

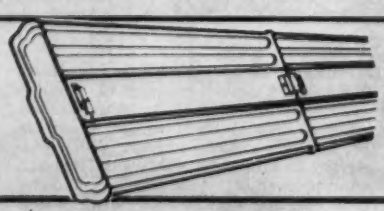


SHIELDING — All fixtures provide 45° crosswise shielding and are available with choice of 25° or 45° lengthwise shielding.

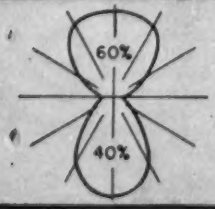
END CAPS — Satin finish aluminum end caps available — order separately.



PENDANT MOUNTING — Stem hanger assemblies are required. Single stem hangers used for continuous row mounting. Twin stem hangers for the mounting of individual 48″ lamp fixtures.



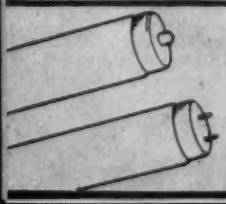
SURFACE MOUNTING — Units may be attached directly to the ceiling. Available as optional equipment are surface mounting plates and top reflectors.



OK

A quality fixture throughout!

85% EFFICIENCY — Translucent plastic side panels and center panel give low brightness for more comfortable seeing and high efficiency. Made of sturdy Polystyrene, they will not warp or discolor. For further seeing comfort 60% of the light is directed above the horizontal.



FIXTURES — 2 lamp and 4 lamp units available for 48 inch 38 watt and 96 inch 74 watt single pin lamps, as well as 48 inch 40 watt bi-pin lamps.

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With Bermico Lifetime Conduit you get the greatest possible protection for your cable—at low cost. It means fewer outages, uninterrupted service for your customers, less expense for you.

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SALES ASSIGNMENTS

COMPANY STAFFS

Kaiser Aluminum & Chemical Sales, Inc, Oakland, Calif., has appointed J. P. Moran as building wire specialist. Temporarily assigned to the Philadelphia sales office, Moran will co-ordinate the national sales program for aluminum building wire. Since joining Kaiser in 1950, he has served as electrical conductor product salesman for the New York and Philadelphia districts.

Sylvania Electric Products, Inc, has named Charles I. Brady district sales manager of combined New York City-Newark, N. J., area for the firm's Lighting Division. Brady, formerly sales manager of Sylvania's lighting fixture department, will make his headquarters at the firm's recently completed sales office and warehouse at 1000 Huyler St., Teterboro, N. J.

Graybar Electric Co, Inc, New York, has made the following appointments: H. D. Epps, formerly operating manager for the company at Miami, Fla., was appointed district operating manager at Pittsburgh. C. A. Rettenmayer, who has filled various district managerial posts for Graybar, was named district operating manager at Minneapolis replacing A. C. Wehman, who is retiring. F. P. Hoeffler, who has served as an executive aide in the company's New York offices, was named district operating manager at St. Louis.

Pittsburgh Reflector Co, Pittsburgh, Pa., has appointed S. E. Gardner as a representative to cover the entire southern California area from headquarters in Los Angeles. John A. White, Jr., has been made representative for the northern and central New Jersey area and he will make his headquarters in New York. Both men will handle the complete line of Pittsburgh Permaflector fluorescent and incandescent lighting equipment.

Phelps Dodge Copper Products Corp has named Russell C. Bowen as central regional manager, distributor sales with headquarters at 100 West Monroe St., Chicago, Ill.

S. Morgan Smith Company of York, Pa., has added Robert A. Cyphers as a representative of its Turbine Sales Division at 3240 Peachtree Road, N. E., Atlanta 5, Ga.

Westinghouse Electric Corp has named J. M. Oliver, branch manager of Birmingham office, manager of its newly formed regional sales district, to be known as the Central-Southern district, with headquarters in Birmingham, Ala. J. H. Bennett, sales engineer in the Jackson, Miss., sales office, was appointed New Orleans branch manager to succeed R. F. Wright, newly named assistant to the Southeastern regional vice president. Wright will handle special assignments from his New Orleans headquarters. The new district combines areas previously included in territories of Birmingham and New Orleans branch offices.

Line Material Co, Milwaukee, has assigned Earl Kirsch to the position of field engineer in company's Central Division. He will handle L-M sales in northeastern Kansas and northwestern Missouri from L-M's Kansas City office.

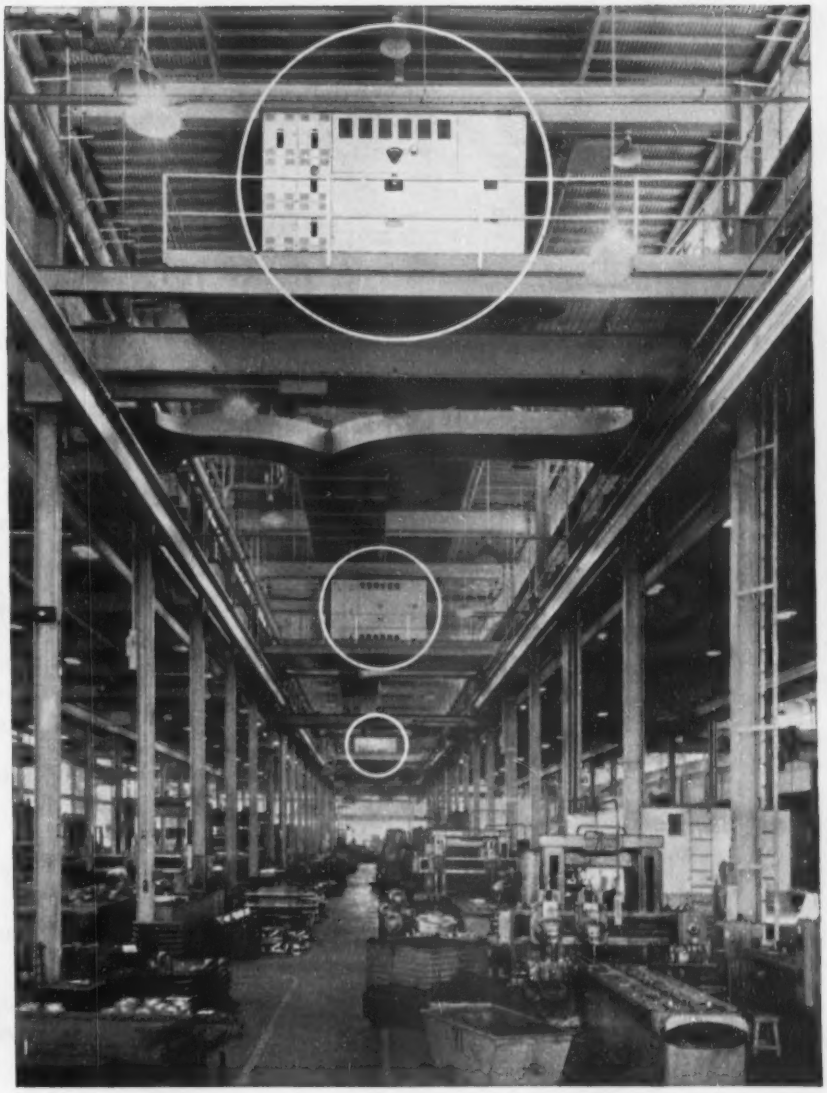
This is how

THE GOSS PRINTING PRESS CO., Chicago obtains

efficient distribution

of electric power with high voltage feeders to load centers, and also

saves floor space



This was accomplished with

SORGEL Dry-Type Transformers,

compactly incorporated into substations, all self-contained, safely enclosed in steel, complete with primary switchgear and secondary circuit breakers, and installed above floor level.

The installation consists of five 500 Kva and two 300 Kva, 3-phase, 4160 volt to 480 volt substations for power, and 13 dry-type transformers, sizes 10 to 50 Kva, 3-phase, 480 volt to 120/208 volt for lighting and portable equipment.

This saved The Goss Printing Press Co. thousands of dollars over a low voltage distribution system, and provided them with the efficiency that only a high voltage distribution can provide.

Again the ingenuity of an owner, his architects, and consulting engineers, combined with SORGEL expert engineering, resulted in a most modern, flexible, space-saving and efficient electric distribution system.

By using SORGEL dry-type transformers in substations, all vaults have been eliminated, and by installing the substations overhead, more floor area was made available for production.

Architects — Olsen & Urbain
Engineers — Neiler, Rich & Bladen
Electrical Contractor—The Edward Electric Co.

Sales Engineers in Principal Cities

SORGEL ELECTRIC CO., 834 West National Ave., Milwaukee 4, Wis.

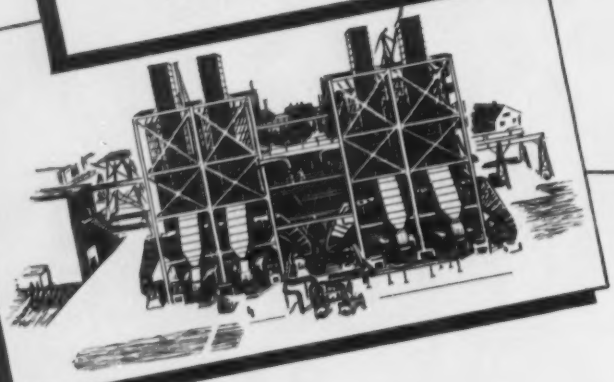
40 years experience in the development, manufacturing and application of transformers

GO on GREEN

4 Green Forced Draft Fans

4 Green Induced Draft Fans

...Serve the West Junction Plant of Houston Lighting & Power Company



Houston Lighting & Power Company is a leading factor in the power field of the great southwest. That it approved the selection of Green Draft Fans by the boiler manufacturer — in this case Riley Stoker — is evidence of high acceptance in the field. No utility can afford to operate with inferior or unsuitable equipment at any point. It must have equipment that is not only highly efficient but right.

To Houston Lighting & Power can be added other well-known recently completed utilities that are Green Fan plants, among them the following:

Central Hudson Gas & Electric Co.
Atlantic City Electric Co.
Virginia Electric & Power Co.
Monongahela Power Co.
Louisiana Power Light Co.
Kansas Gas & Electric Co.
El Paso Natural Gas Co.
Pacific Gas & Electric Co.
South Carolina Public Service Authority
Buffalo Niagara Electric Corp.

With utilities as with industrial power plants, it's safe to "Go on Green" when it comes to draft fans.

Our Catalog No. 168 tells all about Green Fans. Write for a copy.

THE GREEN Fuel Economizer COMPANY INC.

BEACON 3, NEW YORK

ECONOMIZERS • FANS • AIR HEATERS • CINDERTRAPS

Meetings Calendar

(*Continued from page 63*)

IOWA UTILITIES ASSOCIATION
Annual Management Conference, Hotel Fort Des Moines, Des Moines, Iowa, Oct. 11-12.

NATIONAL INDUSTRIAL CONFERENCE BOARD
Third Annual Conference on Atomic Energy in Industry, Hotel Commodore, New York, Oct. 13-15.

NATIONAL SAFETY CONGRESS-EXPOSITION
Conrad Hilton Hotel, Chicago, Oct. 18-22.

ATOMIC INDUSTRIAL FORUM, INC
Meeting on "Atomic Opportunities in New England", in conjunction with New England Council, Statler Hotel, Boston, Oct. 20.

OKLAHOMA UTILITIES ASSOCIATION
Electric Light and Power Division, Western District Meeting, Duncan, Okla., Oct. 21; Eastern District Meeting, Ada, Okla., Oct. 22.

SOUTHEASTERN ELECTRIC EXCHANGE
Accounting Section, Roanoke Hotel, Roanoke, Va., Oct. 21-22; General Sales Conference, Roosevelt Hotel, New Orleans, La., Oct. 28-30; Accident Prevention Committee, Heidelberg Hotel, Baton Rouge, La., Nov. 11-12.

***NATIONAL ASSOCIATION OF CORROSION ENGINEERS**
Symposium on Corrosion of Underground Structures sponsored jointly by NACE's Niagara Frontier Section and University of Buffalo at university's campus, Buffalo, N. Y., Oct. 27-28.

PUBLIC INFORMATION PROGRAM
Annual Workshop Conference, Chase and Park Plaza Hotels, St. Louis, Oct. 27-29; Mid-Atlantic Region, Hotel Statler, Washington, D. C., Nov. 12.

AMERICAN WELDING SOCIETY
National Fall Meeting, Sherman Hotel, Chicago, Nov. 1-5.

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
Annual Meeting, Haddon Hall Hotel, Atlantic City, Nov. 8-11; Winter Meeting, March 7-11, 1955.

NATIONAL ASSOCIATION OF RAILROAD AND UTILITIES COMMISSIONERS
Annual Convention, La Salle Hotel, Chicago, Nov. 8-12.

AMERICAN STANDARDS ASSOCIATION
36th Annual Meeting and 5th National Conference on Standards, Hotel Roosevelt, New York, Nov. 15-17.

WISCONSIN UTILITIES ASSOCIATION
Electric-Gas Sales and Engineering Convention, Schroeder Hotel, Milwaukee, Nov. 17-19.

NATIONAL FARM ELECTRIFICATION CONFERENCE
1954 Meeting, Van Curler Hotel, Schenectady, N. Y., Nov. 18-19.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS
Annual Meeting, Statler Hotel, New York, Nov. 28-Dec. 3.

21ST NATIONAL POWER SHOW
Sponsored by American Society of Mechanical Engineers, Commercial Museum, Philadelphia, Dec. 2-7.

EASTERN JOINT COMPUTER CONFERENCE-EXPOSITION
Sponsored jointly by American Institute of Electrical Engineers, Institute of Radio Engineers, and Association for Computing Machinery; Bellevue-Stratford Hotel, Philadelphia, Dec. 8-10.

*Additions this week.

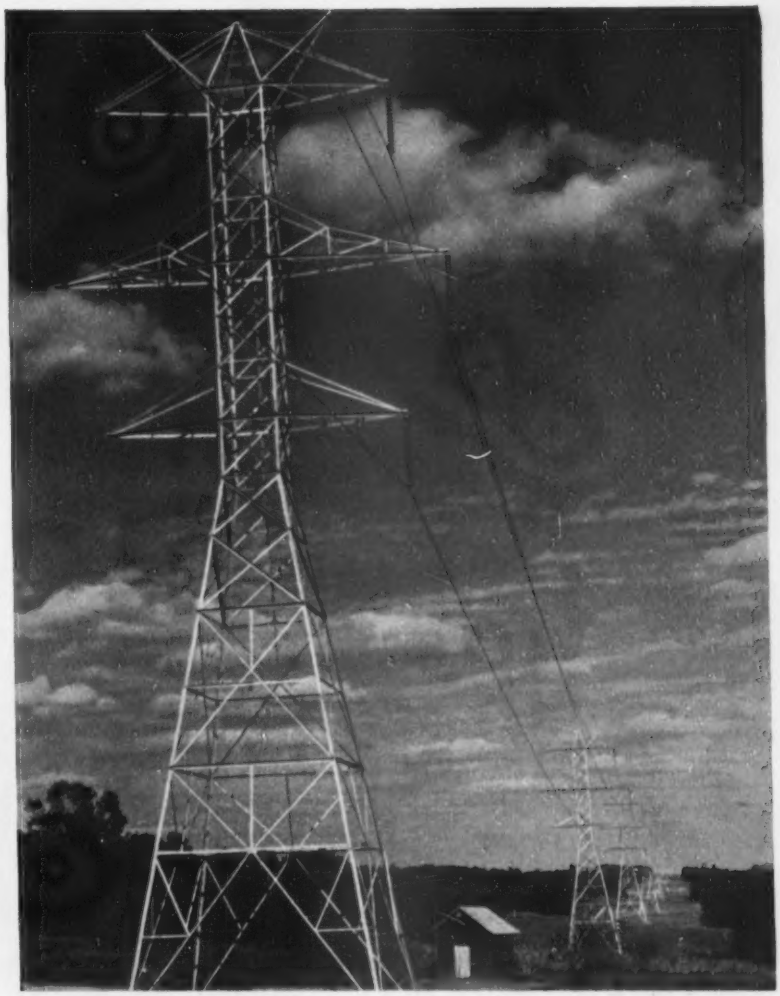
Duke Power Co. Builds Southeast's First 230-kv Line

New 75-mile high-voltage line transmits five times the capacity of former 100-kv system

The most advanced and highest-capacity transmission line in the Southeast was put into operation late in 1953 when the Duke system completed its new 75-mile, 230-kv "super-highway." Constructed at a total cost of about $6,000,000, which includes terminal and accessory equipment, the line serves as a main artery running from the Riverbend steam-electric plant, near Charlotte, N. C., to Duncan, S. C., in the busy Greenville-Spartanburg area.

INCREASED CAPACITY . . . Duke's postwar $250 million expansion program, calculated to meet the fast-increasing power needs of the booming industrial Piedmont, began with the installation of large steam-electric units at various generating plants. In order to move the resulting big blocks of power long distances, it became necessary to augment the existing 100-kv system. The new 230-kv line — as well as similar circuits now being planned — has five times the transmitting capacity of the old lines.

LOFTY TOWERS . . . Just as the new line far exceeds the old in transmitting capacity, the 230-kv towers dwarf their 100-kv counterparts. The new double-circuit suspension towers, designed and fabricated by Bethlehem Steel Company, weigh about ten tons each, and rise 120 ft into the air. Normal span length is 900 ft, or about six towers per mile. The towers carry two overhead shield wires, ⅜-in. diam H. S. steel, and are equipped with 795,000 circular mil conductors of steel-reinforced aluminum cable, 1.10 in. in diameter. The towers' "lightning-proof" design provides for eighteen insulator units totaling 9½ ft of insulation, and allows 7½ ft minimum clearance between conductors and tower steel when an insulator is deflected 30 deg by transverse wind loads. Because of these and other features of design, Duke expects an absolute minimum of operating difficulties due to lightning, wind and other adverse weather conditions.



Silhouetted against the North Carolina sky, each of these 230-kv towers is higher than a ten-story building. Only one circuit had been strung when this picture was taken.

FABRICATED IN LEETSDALE, PA. . . . The tower steel was fabricated and galvanized at the Bethlehem Fabricating Works in Leetsdale, near Pittsburgh. Other Bethlehem tower-fabricating works are located in South San Francisco, Calif., and Seattle, Wash.

If you would like to have information about Bethlehem's design and fabrication of transmission towers, please call the nearest Bethlehem sales office.

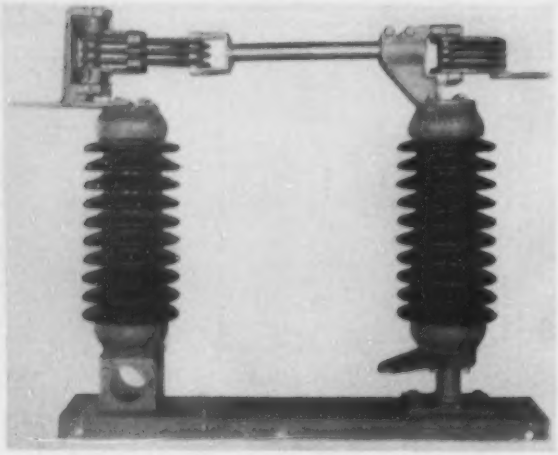
The new line follows a southwesterly course for 75 miles from the Riverbend Steam Plant to Duke Co.'s transformer station at Duncan, S. C.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

NEW EQUIPMENT



Side-Break Switch

Side-break switch is made in 7½ to 161 kv ratings. Current ratings are 400, 600, and 1,200 amp. Front and hinge contacts utilize high-conductivity beryllium rods. Blade assembly and insulator adaptor of simple design are claimed to be more rugged. The permanently sealed bearing assembly has only five separate parts.

Royal Electric Manufacturing Co, 1187 East 87th St, Chicago 19, Ill.

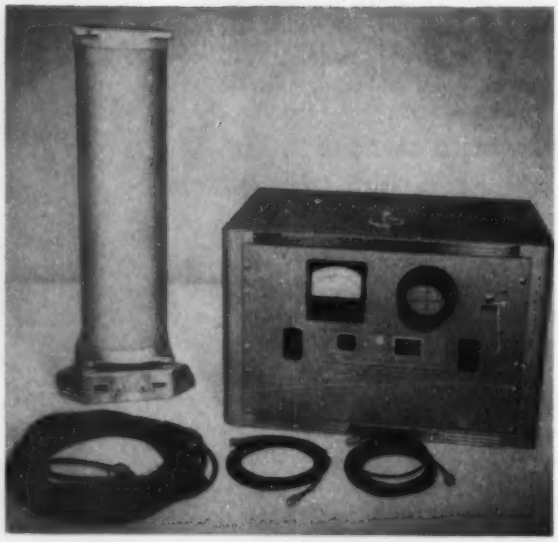
Corona Testing Equipment

Corona test set, Model 3, is designed to facilitate nondestructive testing of insulation in electrical equipment. It detects electric discharges that may result when an ac test voltage applied to equipment exceeds a critical value. In many types of equipment, particularly that with dry-type organic insulations, absence of discharges at the operating voltage is sufficient assurance of good insulation condition at time of test.

In operation, an autotransformer gradually increases the input to a step-up transformer until the test voltage is applied to the equipment or corona occurs. The test set is designed for 0 to 30 kv, 60 cps input. Models 1 and 2 include autotransformer and a 20 kv transformer, but Model 3 is supplied without these units and is for use with existing transformers. (Bulletin 66)

Corona current is displayed as vertical pulses on a cathode-ray oscilloscope. Horizontal sweep is 60 cps, phased to show corona in the center of the pattern.

James G. Biddle Co, 1316 Arch St, Philadelphia 7, Pa.



Hobby Kit

Educational hobby kit teaches youngsters basic electronics. This Kit No. 1, the first of a series, allows construction of two-tube radio receivers, transmitters, batteries, and experiments with sound and electricity. Experiments include static electricity and a compass galvanometer.

RCA manufactures the kit under the Educational Hobby Kit program to enable young people to learn by doing. The book of instructions with the kit was prepared under the guidance of Encyclopedia Britannica. Kits are on sale at department stores, toy shops, and hobby stores. Other kits by other manufacturers will cover geology, meteorology, optics, and medical training.

Industrial America, Inc, Merchandise Mart Plaza, Chicago 54

Air-Break Starters

A new line of air-break starters for 2,200-5,000 v squirrel-cage, wound-rotor, and synchronous motors provide adequate short-circuit protection under presently available kva capacities. These starters are built in three styles: (1) 50,000 kva interrupting capacity, (2) with power fuses for systems of 150,000 kva (2,300 v) and 250,000 kva (4,600 v) availability, and (3) in the Valimitor (volt-ampere-limitor) style in which air-core reactors limit infinite kva to a finite value within the rating of the starter.

The Type ZHA air-break contactor has an interrupting capacity of 50,000 kva. High silicon steel blow-out ears are magnetized from a single blow-out coil on each pole. The arc chutes are equipped with cooling plates which remain moisture-free for high efficiency to cool and extinguish the fault arc quickly.

The complete starters incorporate a safety door switch on the disconnect-switch compartment. Other features include swinging overload relay panel,

Extra STRENGTH BEAUTY

WITH HAPCO *Aluminum Alloy* BRACKETS AND STANDARDS

This 10-inch diameter pole at a corner location harmonizes with the regular smaller diameter standards, yet has the extra weight and strength required.

An Indiana city found a happy solution to its street lighting problems in Hapco Aluminum Alloy Standards and Brackets. Dead end and corner locations are provided with poles of larger diameter and greater weight, with the same design features as the other standards.

Extra Strength . . . The Hapco method of production offers a desirable versatility in providing the poles required for heavy duty or special services while still maintaining the harmonious beauty of the system.

Extra Beauty . . . All Hapco Standards are Venetian column type acclaimed by architects for eye appeal and strength. Every pole is one piece, free from longitudinal seams or transverse joints, and is of uniform wall thickness throughout. Standards and brackets are mat finished for permanent beauty without maintenance or painting cost.

The lighting system in the business section is beautiful by day as well as by night, thanks to Hapco graceful standards and brackets in permanent aluminum alloy.

HUBBARD ALUMINUM PRODUCTS COMPANY

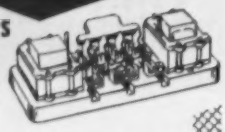
MANUFACTURERS OF HAPCO QUALITY ALUMINUM PRODUCTS

A Division of HUBBARD and COMPANY

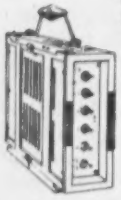
6301 Butler Street • Pittsburgh 1, Pa.

Recommended
these
METER TESTING ACCESSORIES
Now in use by Leading Utility Companies

PHASEFORMERS



ACCURATELY MEASURES REACTIVE POWER: when properly connected to a watthour meter will provide for that meter the proper potentials lagging 90° in phase from the normal circuit potentials, together with a switching arrangement whereby the meter connected thereto can be checked as a straight watthour meter.

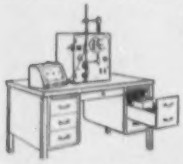


TYPE TRF RESISTANCE LOAD

The addition of a current operating fan on this item is to aid the natural draft condition and make possible a maximum capacity of 24 amperes load current at 240 volts in an aluminum case.

ROTARY TAP SWITCH

ALL INCLUSIVE FEATURES: high current capacity, non-arcing, high voltage capacity, inductive load capacity, numerous circuit combinations, special high current connections, positive action, compact design, fully enclosed.

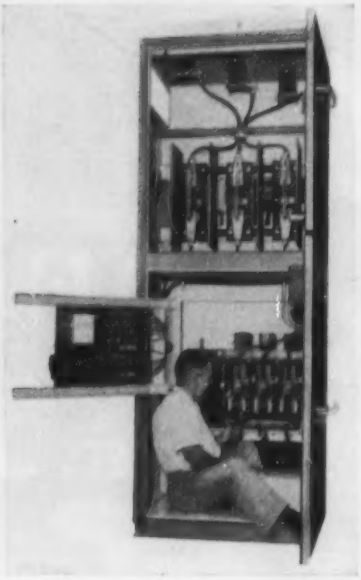


METER TEST BOARD

So many requests have been received to provide a packaged, up-to-date, compact meter test board unit, we are presenting this equipment which has many features for efficient operation.

Write for Complete Information

EASTERN SPECIALTY CO.
PHILADELPHIA 40, PA.



self-contained bus for group installation, meters as required, and cabinet doors which may be lifted off concealed-type hinges during installation. The contactor is accessible from the front and rear of the cabinet.

Electric Controller & Manufacturing Co, 2700 E. 79th St, Cleveland 4, Ohio

Mechanical Ladder

Mechanical ladder, Series 2200, has gear-and-sector elevation mechanism. Center spring counterbalancing is said to take the hard work out of operating the mechanical ladder. A safety locking plunger prevents accidental movement after adjustment. Worm-and-gear turning allows safe and easy rotation even on hills.

J. H. Holan Corp, 4100 W. 150th St, Cleveland 11, Ohio

Pole Numbers

Number plates for pole lines aid in aerial inspection of transmission lines over rural areas. Plates are made with a single digit—any combination of numbers can be arranged. Plates are 18 gauge steel and finished in porcelain enamel. They are generally supplied in yellow background with black numbers, and 6 x 5 in., but can be supplied to customers specifications.

Industrial Products Co, 2808 N. Fourth St, Philadelphia 33, Pa.

Underground Feeder

Thermoplastic-insulated and -jacketed cable, Durall-T, is now approved as Type UF under the underground-feeder classification of the National Electrical Code. The cable is resistant to chemicals, moisture, corrosion, fungi, and mechanical damage and similar "harsh-atmosphere" locations which abound on farms. In addition to use in underground circuits on the load side of the meter, it can be installed in walls of masonry block or tile or imbedded in plaster.

Anaconda Wire & Cable Co, 25 Broadway, N. Y. New York, N. Y.

Cable Inspector

Automatic electrical cable inspector system is based on continuous scanning circuitry. Conductors are scanned for automatic megging at a rate of 1 per second. Insulation checking is to 110 megohms at 350 v dc.

The inspector can automatically identify individual wires in multiconductor cables, conduit, wireways, and terminal boxes. It checks insulation of each conductor to ground and to every other conductor. Operation is on 115 v, 60 cps. It consists of a Master and Slave unit, each measuring 24 x 6 x 14 in.

Panascan Div, Panellit, Inc, 7401 N. Hamlin Ave, Skokie, Ill.

Neutral Bar

Neutral bar is made of extra hard drawn seamless copper tubing. The circuit bars are forged into the main line connector at a 20-deg angle for easy wire insertion of branch circuit wires. Circuit taps take 14-6 and the main line load takes 250Mcm-6 wire. Washer head screws are eliminated—wires are inserted in V-shaped holes.

Ilsco Copper Tube and Products, Inc, Mariemont Ave, Cincinnati 27, Ohio

Reed Tachometers

A line of Standco vibrating-reed tachometers includes both portable and stationery types. The tachometers operate on the principle of resonance to measure speeds of totally enclosed

it's time for a new meter...

when Mrs. Steele gets her all electric kitchen

When Mrs. Steele is busy in her all-electric kitchen, she uses many convenience outlet appliances at the same time. This often proves to be too much for a meter *not built* to measure modern loads.

The new Sangamo J2 Meter is designed to measure not only today's loads but the loads of the future because it has plenty of reserve capacity . . . straight-line accuracy up to 100 amperes.

Corrosion-resistant materials and finishes, an oilless, maintenance-free bearing system and low disk speed all add up to extra long life.

Choose the new Sangamo J2—the first . . . and finest . . . 15 ampere meter with 100 ampere capacity.

A METER WITH STRAIGHT LINE ACCURACY

UP TO 100 AMPERES

SANGAMO
ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

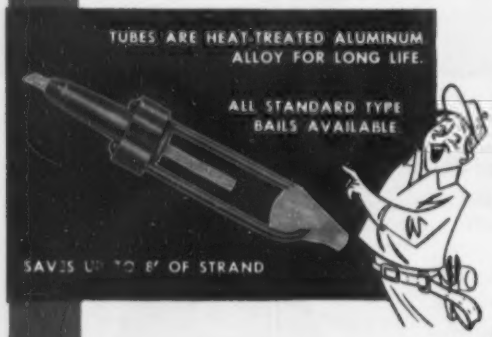
JM54-9

STRANDVISE®

THE SELF-ACTING SELF-CONTAINED TOOL FOR TERMINATING STRAND

Wherever strand is to be terminated, STRANDVISE provides a means that is unmatched for speed and versatility. Many Utilities now know what STRANDVISE does for their pocketbooks.

STRANDVISE makes it possible to install guy wires without waste of time or strand, to terminate suspension strand or ground wire quickly and easily. STRANDVISE, equipped with a new 18″ flexible bail, simplifies "false dead-ending" (slack span construction).



STRANDVISE grips surely yet permits easy accomplishment of desired tension or later adjustment to take up slack in strand.

Write for sample STRANDVISE so you may see for yourself its many advantages.

Reliable ELECTRIC COMPANY
3145 Carroll Avenue
Chicago 12, Illinois

Over 45 years of service to the utilities

POWER LINE CONNECTORS AND CONSTRUCTION SPECIALTIES

equipment, requiring no contact with rotating shafts or moving machine parts. Each unit consists of a set of carefully calibrated steel reeds which are tuned to selected frequencies of vibration. Ranges are available between 900 and 100,000 rpm. Bulletin 770A, 4 pages, contains full information.

Herman H. Sticht Co, Inc, 27 Park Place, New York 7, N. Y.

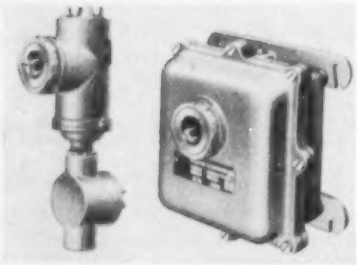


Photo Control

Light source transmitter and photoelectric tube receiver in explosion-proof Condulets enable automation techniques to be employed in hazardous industrial or transportation areas.

Light is provided by Type EPL 243 Condulet; light detection by Type EPA 342 Condulet, a light-sensitive electronic control relay. Whenever appearance or absence of light is detected through a lens by the receiver's photoelectric tube, a relay opens or closes the electrical circuit. The units are classified for use at Class I, Group D hazardous locations.

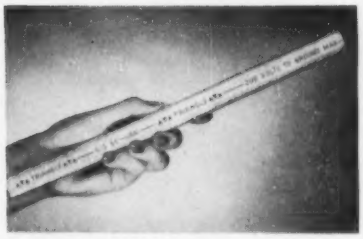
Crouse-Hinds Co, Wolf & Seventh North St, Syracuse, N. Y.

TV Telephone

Television-telephone intercom system (TV-T) resembles a conventional 17-in. television receiver with a telephone handset beside the screen. When the telephone receiver is lifted from its hook, the caller's image appears simultaneously on one-half his screen and on half of the screen of the called party. When the latter answers, his image is shown on the remaining half of each screen.

The screen area is available for viewing signatures, blueprints, documents, etc. When not in use as an intercom, the screen may be used for monitoring an industrial closed-loop

TV system, or for taking TV broadcast programs from the air.
Kay Lab, 1090 Morena Blvd, San Diego 10, Calif.



Entrance Cable

Service entrance cable now has a "silver" finish. The new finish is claimed to be cleaner to handle, better looking, and easier to strip. Also, it is said to give added protection against weather and assure a longer life. Outer braid of glass and cotton prevents festooning. Cable is produced in popular sizes, 10 through 2 AWG, in SE-ABN and SE-UBN types.
Triangle Conduit & Cable Co, Inc, Triangle and Jersey Ave, New Brunswick, N. J.

Grid Resistor

Mill-type all-welded grid resistor (Bulletin 11011) is rated 180 amp per box in ratings from 1/10 to 10 ohm. Grids are insulated for 600-v service. End plate construction compensates for expansion and affords an easy replacement of the grid assembly. (Publication EC-63)
Cutler-Hammer, Inc, 235 North 12 St, Milwaukee, Wis.

Dry Box

Controlled atmosphere dry box is designed for laboratory and industrial assembly. Because of low price, it can be thrown away after radioactive contamination.

One-piece molded box weighs 15 lb. It can be hermetically sealed in 30 sec. Relative humidity is controlled to a constant 1%. Transparent plastic is heat and chemical resistant. It uses filter system to control dust to 1 micron.
P. M. Lennard Co, Inc, 671 Bergen St, Brooklyn 38, N. Y.

STRANDLINK®

THE SELF-ACTING SELF-CONTAINED TOOL FOR SPLICING STRAND

Wherever strand is used, whether for ground wire, suspension strand, down guys or anything else, STRANDLINK is the most economical means for splicing.

STRANDLINK makes the splicing of any grade or size strand simple and easy yet safe and sure. The exclusive Reliable Pilot Cup caps and guides the strand to its proper position. Nuts, bolts, hardware and johnny balls are eliminated. STRANDLINK costs much less than alternate pieces of hardware before installing time is even taken into account.

Hundreds of case-hardened, plated steel teeth in each gripping chuck HOLD firmly and permanently. Assembly is factory treated with corrosion inhibitor lubricant.

Ask on your company letterhead for a sample STRANDLINK; it will be sent promptly without charge.

JAWS OF GRIPPING CHUCK SURROUND STRAND TO HOLD PERMANENTLY.
PILOT CUP IN NOSE GUIDES STRAND THROUGH.
MADE FOR ¼" TO 7/16" STRAND.

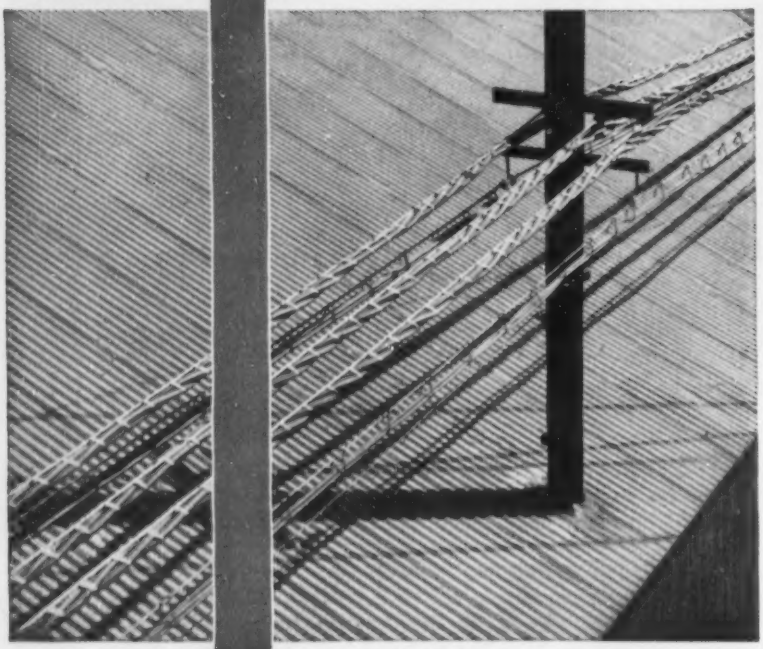
Reliable ELECTRIC COMPANY 3145 Carroll Avenue Chicago 12, Illinois

POWER LINE CONNECTORS AND CONSTRUCTION SPECIALTIES

an ACCO product

PAGE

Stainless Steel Strand



for Severe Service Conditions

• The photograph above shows just one example of how PAGE Stainless Steel Strand is ideal for applications involving rugged service conditions.

Here, PAGE Stainless Steel Messenger Strand, with stainless steel lashing tapes, supports perfectly a series of insulated conductors through a highly corrosive fume area above a steel cleaning house.

PAGE Stainless Steel Strand is equally versatile for ground, guy and catenary applications. Its higher tensile strength, corrosion-and-abrasion resistance, elastic limit and strength-to-weight ratio make it your first choice! And—its lower cost *per year* of use means long-range economy.

ACCO

Page Steel and Wire Division
AMERICAN CHAIN & CABLE

Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Bridgeport, Conn.

PAGE Strand

MORE NEW PRODUCTS
about which you should know

Aluminum Company of America, Alcoa Bldg, Pittsburg 19, Pa., has aluminum "I. G." **welding electrode** for inert-gas, shielded arc use, made from 2S, 43S, and A54S, on 10-lb spools, sizes .020 to ⅛ in. . . . Lincoln Electric Co, Cleveland 17, Ohio has developed a **method of welding,** Self-weld, claimed to be greatly simplified for amateur welders.

General Electric Co, Schenectady 5, N. Y., has 300-amp, NEMA-rated, rectifier-type **welder** (6WR30B). Range is 20-375 amp using moving-primary design. Input is 220/440 or 550 v (Publication GEC-1267) . . . Royal Arc Industries, Inc, Chillicothe, Ill., has 59-lb Model 200A **welder** for 5/32-in electrode and 110/220 v single-phase input.

Coming New Equipment
Received Too Late For This Issue

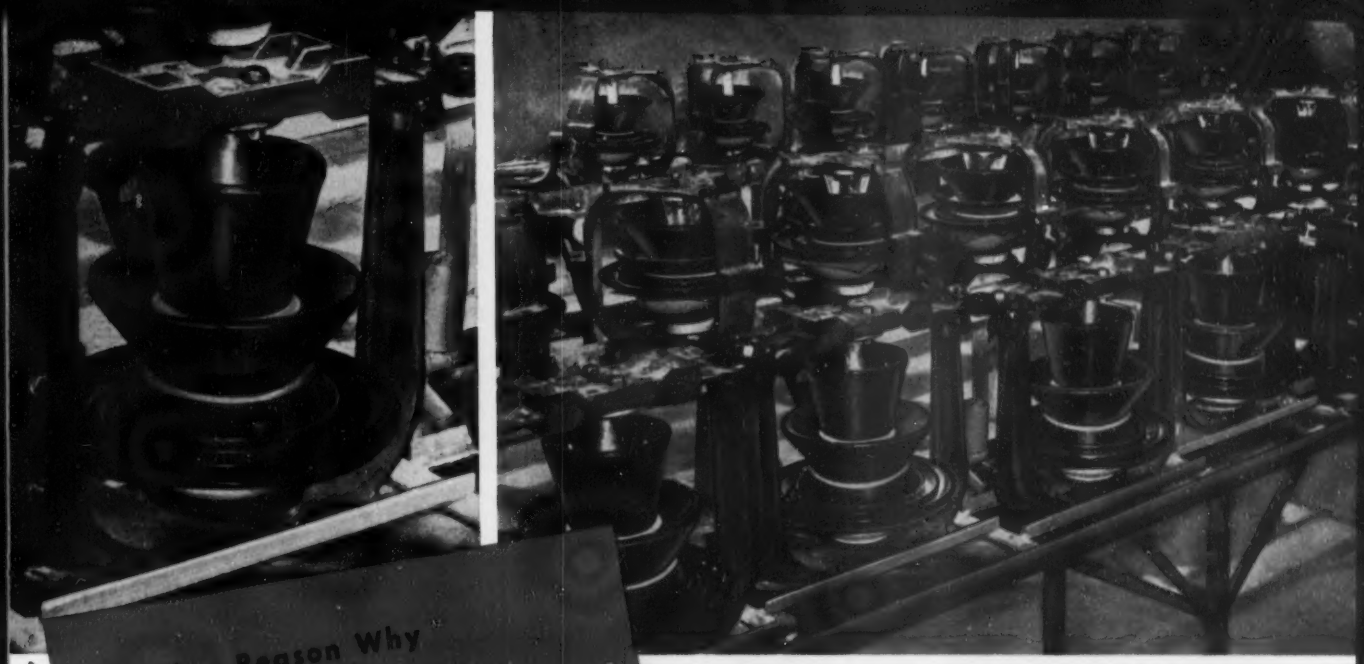
Dead End Clamp
Porcelain Products, Inc—of malleable iron for hot-line work

Temperature Monitoring
Thomas A. Edison, Inc—system protects widely scattered points

Rodon, Inc, Neshaminy, Pa., has Connectoreel **cable reel unit** claimed to wind any diameter of cable without disconnecting ends or using slip rings or sliding contacts.

Atlas Mineral Products Co, Mertztown, Pa. has Ampcoflex Type 1 normal impact and Type III optimum impact unplasticized **polyvinyl-chloride pipe,** fittings, sheet, and fabricated structures. Pipe and fittings are ½ to 6 in. IPS. Atlas also has amphesive, a room-temperature, **expoxy-based adhesive** composition.

Tulsa Winch, Div of Vickers, Inc, Tulsa, Okla, has Model 5 **winch** 11-in. high, weighing 80 lb, for safe working loads of 6,000 lb. Worm gear with



Another Reason Why

VICTOR Makes Better Insulators

Left: Victor uses seasoned cast-iron jigs for greatest accuracy.
Above: Victor Apparatus Insulators assembled in precision-aligned jigs.

WE USE ACCURATE JIG ASSEMBLY METHODS

APPARATUS INSULATORS require accurate assembly of porcelain and metal parts to achieve perfect alignment and accuracy of installation on the job.

One of many reasons why Victor apparatus insulators have such enviable service records is Victor's use of precision-built cast-iron jigs. Here, every insulator is clamped in position to assure accurate alignment. Before shipping, each unit is thoroughly tested mechanically and electrically in accordance with NEMA specifications.

Buy Victor and you're sure of correctly designed, painstakingly manufactured and thoroughly tested insulators of *Purified* Porcelain—finest insulator porcelain ever made!

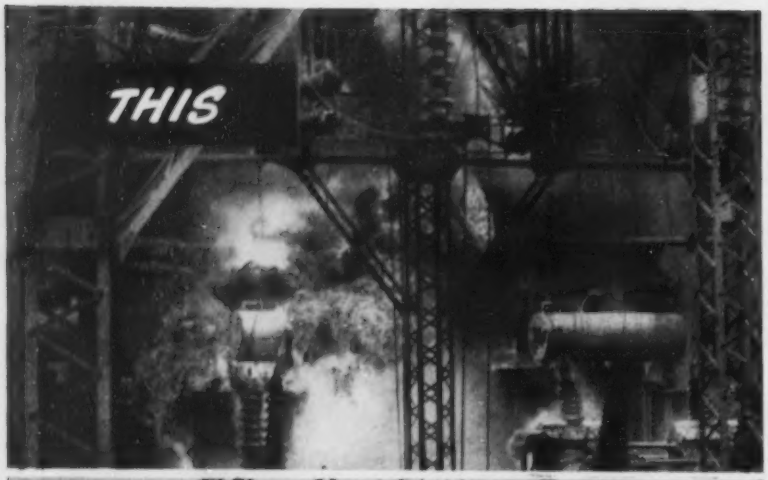
VICTOR
NO. 729
STACKING UNIT
(TR NO. 140)

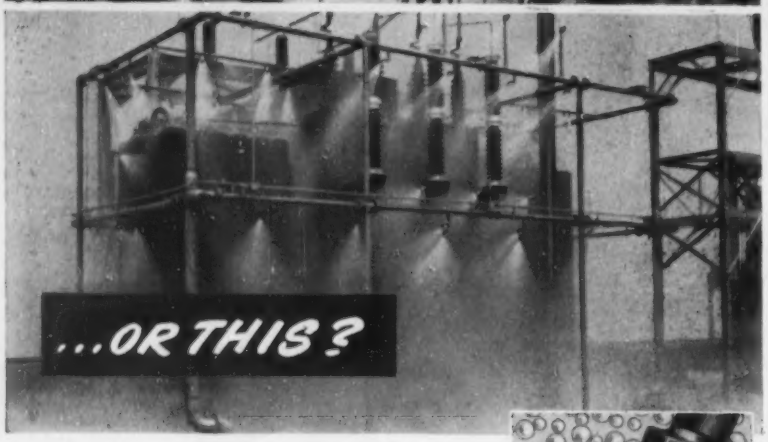
Specify

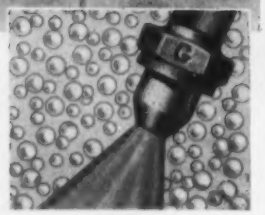
VICTOR PURIFIED PORCELAIN INSULATORS!

VICTOR INSULATORS, INC., VICTOR, N. Y.
SUBSIDIARY OF I-T-E CIRCUIT BREAKER CO.

Low and High Voltage Pintypes • Suspensions • Guy Strains • Spools • Switch and Bus Insulators
Custom Designed Porcelain







To protect your equipment, install safe, fast-acting GRINNELL MULSIFYRE

All it ever takes, at any time, is for an arc to come in contact with oil to touch off a fire. If unchecked, as with the $50,000 blaze in the top picture, damage can be extensive.

But if there are spray projectors of a Grinnell Mulsifyre System on guard, such as those being demonstrated in the lower photograph, extinguishment usually can be obtained in a matter of seconds. In fact, the record is replete with cases of fires, occurring in oil, which fast-acting Grinnell Mulsifyre Systems have put out in quick time.

A Grinnell Mulsifyre Systems is effective wherever the danger of fire in medium or heavy oils can be limited to a definite area. In these oils the surface emulsion remains to give after-protection against flashback.

There are hundreds of dependable Mulsifyre installations in service all over the world. Get the facts on how you can save trouble and expense with a reliable Grinnell emulsion-forming spray system. Write Grinnell Company, Inc., 252 West Exchange Street, Providence, Rhode Island. Branch offices in principal cities.

GRINNELL *Mulsifyre*

EMULSION-EXTINGUISHMENT OF OIL FIRES

60:1 ratio eliminates need for worm brake. It can be installed as convenient—it can be driven from right or left side of the transmission.

General Radio Co, 275 Massachusetts Ave, Cambridge 39, Mass., has high-speed, automatic **line-voltage regulator** (Type 1570-A) rated 6 kva, 98% efficient, using a Variac for buck-or-boost and a servomechanism . . . Sorensen & Co, Inc, 375 Fairfield Ave, Stamford, Conn., has **"Power in a Package"** giving combination of regulated ac (150 to 1,000 va), high-current dc (5 to 40 amp, 6 to 28 v), and high-voltage dc (0-600 v, 0-500 ma).

Cutler-Hammer, Inc, 235 North 12 St, Milwaukee 1, Wis. has heavy-duty **pressure switch,** Bulletin 10007, with nylon-reinforced neoprene diaphram, for air compressors, water pumps, etc (Bulletin EC-77) . . . Robert-Fulton Controls Co, Box 400, Knoxville, Tenn. has **temperature regulator** for internal combustion engines, etc. Thermal element use a solid, wax-like compound which generates a powerful force upon melting.

Alto Scientific Co, 3404 Cowper St, Palo Alto, Calif. has **calorimetric wattmeter,** Model L-20, for measuring 10 mw to 10 w, dc to 10 kMc, 5% accuracy . . . Bristol Co, Waterbury 20, Conn. has line of **control instruments** for use with environmental test cabinets. Program controllers use a cut cam as a template for the desired program.

Automatic Switch Co, 391 Lakeside Ave, Orange, N. J. has line of compact two-way packless **solenoid valves** for air, gas, water, light oil, and other noncorrosive fluids; has standard, watertight, or explosion-proof solenoid enclosures; pipe sizes ⅜, ½, ¾, and 1 in.; 250 psi air (normally open); 200 psi air (normally closed); coil consumption, 10 w (Form 708, Bulletin 8210A).

Electronic Engineering Co, 180 S. Alvarado St, Los Angeles 57, Calif. has Model 111 **electronic counter** ruggedized for military fiield use from −20 to 150 F. It counts up to 99,999 at rates up to 100,000 cps.

General Electric Co, Schenectady 5, N. Y., has high-voltage dc **tachometer generator** with outputs of 50v/1,000 rpm up to 5,000 rpm, and 100v/1,000

rpm up to 2,500 rpm. . . . Offner Electronics Inc, 5320 N. Kedzie Ave, Chicago 25, Ill., has Type M Dynograph direct-writing **oscillograph.**

Allen B. DuMont Laboratories, Inc, 760 Bloomfield Ave, Clifton, N. J., has cathode-ray **oscillograph** for precision time and amplitude measurement from dc to 5 Mc, Model 327 . . . Burroughs Corp, 1209 Vine St, Philadelphia 23, Pa., has high-speed **electronic switch** (multiplexer) for showing up to 10 synchronized sweeps on a conventional oscilloscope.

Johnson Fare Box Co, 4619 N. Ravenswood Ave, Chicago 40, has **automatic control** "brain" which will control an electrical machine operating through a cycle . . . Jordan Electronic Mfg Co, 119 E. Union St, Pasadena 1, Calif., has remote-indicating **liquid level** measuring systems using radioactive source and ionization chamber.

Robertshaw-Fulton Controls Co, Box 400 Knoxville, Tenn., has **thermostat control** for electric heating; range 64 to 80 F, 2 deg differential; rated 20 amp non-inductive load at 250 v ac.

Bendix, York, York, Pa., has Flash-Lok **stroboscopic light** synchronized automatically with the observed phenomena. Input is 65 w, 115 v ac; weight, 21 lb; size, 9½ x 8¼ x 12½ in.

Cutler-Hammer Inc, 315 N. 12 St, Milwaukee 1, Wis., has Bulletin 14166 **ac hoist controller** for wound-rotor motors. It features eddy-current load brake and regulating magnetic amplifier for finer control (Publication EC-165).

Radio Frequency Co, 44 Park St, Medfield, Mass., has high-frequency **induction heater** with controlled hydrogen atmosphere designed for split-second operation . . . Lindberg Engineering Co, 2450 W. Hubbard St, Chicago 12, has motor generation control and heating station for **induction heating,** also 960, 3,000, and 9,600 cps, 50 to 1,250 kw motor generator sets.

Bucyrus-Erie Co, South Milwaukee, Wis. offers **excavators** with torque converter drive . . . National Pneumatic Co, Inc, 125 Amory St, Boston 19, Mass., has **door operator** and control mechanism for industrial plants.

NOW-A Better Tap Connector
THAT'S EASIER TO USE
YET COSTS LESS!

the New IDEAL Tap Connector

The all-new IDEAL Tap Connector is the first big improvement in tap connectors in many years.

Its unique design not only gives *greater* mechanical strength — more contact area and more pressure, but also keeps the connector under constant spring tension. As a result contacts are better, wires can't work loose and "burnouts" are practically eliminated.

Easier to Use!
JUST ONE UNIT!
No Parts to come loose

Easier to Stock!

ONLY THREE SIZES are needed for all combinations from two No.1 wires to one No.10 and one No. 12 or one No. 8 and one No. 14. Connectors are available *without* spacer bars for copper-to-copper or aluminum-to-aluminum, *with* spacer bars for copper-to-aluminum, copper-to-steel or aluminum-to-steel.

Costs Less!
The IDEAL Tap Connector is lower in price than other connectors for practically every combination.

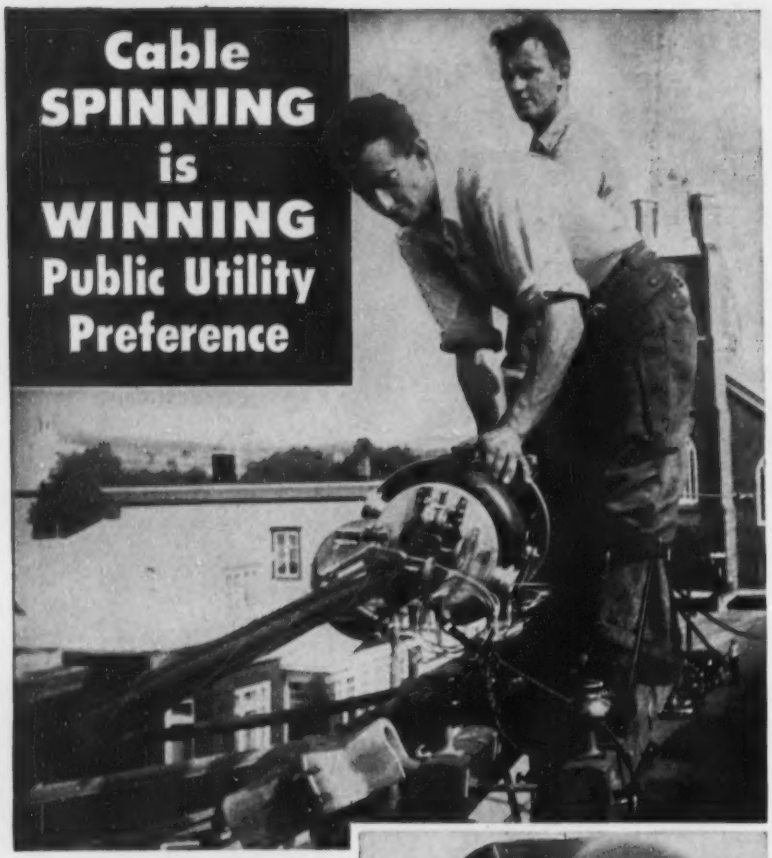
Sold Through Leading Distributors

Ask To See It!
Or mail coupon for full data—how you can save money and have better tap connections!

IDEAL INDUSTRIES, Inc.
1021 Park Avenue, Sycamore, Illinois
Please send catalog data on IDEAL Tap Connectors

Name_____
Company_____
Address_____
City_____ Zone____ State_____

Cable SPINNING is WINNING Public Utility Preference



More and more public utilities every day are turning to the Neale Model "K" Cable Spinner—specially designed for economical and efficient power line use. And here are some of the benefits . . .

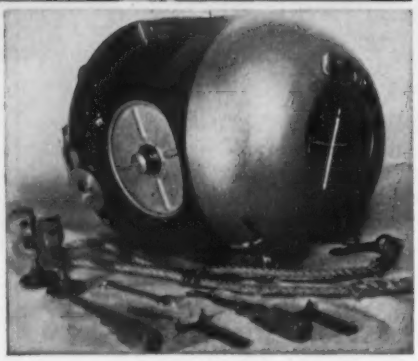
It actually costs much less to install spun cable than pre-assembled cable. And, of course, spun cable saves valuable space in open-wire construction in congested areas.

Light weight single conductor cables may be spun in lengths three times as long as pre-assembled cables . . . to save splices and installation labor.

Spinning reduces cable inventories, because 1/c, 2/c and 3/c cables can be spun in the field as required.

Cable spinning provides a big margin of extra protection against storm damage . . . and has proved invaluable in emergencies of all kinds.

You're invited to send for full technical details on the Neale Model "K". Just drop a line to Cable Spinning, Topeka. *Neale Spinning Wires available in seven different types and sizes.*



Main illustration shows spinning of cable in Canada. Inset is close-up of the Neale Model "K" Cable Spinner, with accessory tools. Model "K" spins a single cable or three 2" cables into a compact triangular pattern. Strand lies in groove formed by two top cables.

HOW IT WORKS. Drum rotates when its two friction drive wheels respond to pulling of wire. Drum revolves once when 13" of wire is pulled — regardless of condition of strand. Drum carries two spools of wire, spaced to spiral 6½" apart for ample cable support. Magnesium castings used wherever possible for lightness and strength. Weight is only 36 pounds. Length 18½", 12" diameter, 4¾" wire exit.

THE WORLD IS SPINNING—TOO! PHONE 2-7224

Cable Spinning Equipment Co.

3100 TOPEKA AVE. TOPEKA, KANSAS

CATALOGS • BULLETINS

● **PLATING:** Bulletin B50-54 (6 pages) shows the design of an automatic plating machine. Wagner Brothers, Inc, 400 Midland Ave, Detroit 3, Mich.

● **CRACK DETECTOR:** A page reprint explains operation of magnetic-particle test unit in checking steel and iron objects for surface cracks or discontinuities. North American Philips Co, Inc, 750 S. Fulton Ave, Mount Vernon, N. Y.

● **WAVE ANALYZER:** Bulletin 54-C (10 pages) shows automatic wave analyzer which provides fourier analysis of vibration and similar data. Davies Laboratories, Inc, 4705 Queensbury Rd, Riverdale, Md.

● **METERS:** A 4-page folder covers Model C reference standard dc voltage and current meter having 14 ranges. Sensitive Research Instrument Corp, Mount Vernon, N. Y.

● **WIND RECORDER:** A data sheet (Form 170) describes wind speed and direction recorder for microclimatology, operates down to fraction of 1 mph, those winds having a major influence on concentration of effluents from smokestacks, etc. Beckman & Whitley, Inc, 912 San Carlos Ave, San Carlos, Calif.

● **MEGGER:** Bulletin 21-20 June 1954, 24 pages, describes the Megger insulation resistance tester; hand-cranked, motor-driven, rectifier-operated, and recording types; principles of operation, accessories, and maintenance. James G. Biddle Co, 1316 Arch St, Philadelphia 7, Pa.

● **MOLECULAR VACUUM GAGE** (GEC-986, 4 pages) describes vacuum gages for measuring without external detectors, 0 to 20 millimeters pressure in dry air. General Electric Co, 1 River Rd, Schenectady 5, N. Y.

● **VIBRASWITCH:** Bulletin 500-1 (4 pages) describes the Vibraswitch, used for vibration measurement or as a protective device installed on rotating or vibrating machines. Beta Corp, Box 8625, Richmond 26, Va.

● **TIME DELAY RELAYS:** A 1-page bulletin (TD400) describes miniature, hermetically sealed time delay relays; timing motor and magnetic clutch type; 2 sec to 3 hr; dc, 50/60, 400 cps. A. W. Haydon Co, Waterbury, Conn.

● **INDICATING AMPLIFIER:** Bulletin 1A (1 page) describes Type 2HLA-3 dc indicating amplifier used for precision measurement of dc signals, or in amplification for recorders or control systems. Doelcam Corp, 1400 Soldiers Field Rd, Boston, Mass.

● **TIMERS:** Page Bulletin AWH RC200 covers miniature, hermetically sealed repeat cycle timers, series 3600, 13600, and 24400, 10 rpm to 1 revolution per day. A. W. Haydon Co, Waterbury, Conn.

● **DC TACHOMETER:** Catalog Sheet 1854 gives specifications on permanent-magnet dc tachometer generators, 2.5v/1,000 rpm and 7.0v/1,000 rpm. Servo-Tek Products Co, 1086 Goffle Rd, Hawthorne, N. J.

● **SMOKE PHOTOMETER:** Bulletin JM-1000A (8 pages) shows a forward-scattering aerosol and smoke photometer. Phoenix Precision Instrument Co, 3803-05 N. Fifth St, Philadelphia 40, Pa.

● **INDICATING CONTROLLERS:** Educational Bulletin 9 (16 pages) gives technical operating details of Series 400 Capacitrols. Bulletin F-6314 (8 pages) gives specifications on various models of

THEY'RE PUNCTURE PROOF!

If it's on the pin, it's in service!

No more searching for defective insulators when your lines are protected with NEW Kimble *Tempered* Glass Insulators.

Why? Because these new insulators are puncture-proof. Exhaustive laboratory tests at values far in excess of A.I.E.E. standards have proved it impossible to puncture a Kimble *Tempered* Glass Insulator in air—*even under voltage impulses far above normal service rating*. Four years of field testing on more than 500 miles of line have produced no puncture failures. Even lightning surges have failed to damage these new Kimble *Tempered* Glass Insulators.

In the event of shattering due to severe mechanical shock, insulator disintegrates into small non-sharp fragments. Trouble shooters can locate broken insulator—fast.

What's the secret? *Tempering*, a Kimble development-in-glass that adds a new element to the many natural virtues of glass. It's an exclusive Kimble production method that gives Kimble insulators a hard-compression surface layer that makes them strong enough to meet the severe tests required.

Why not see how *tempered* glass can cut your line maintenance costs. Write for folder. Address: Kimble Glass Company, subsidiary of Owens-Illinois, Dept. EW 10, Box 1035, Toledo 1, Ohio.

KIMBLE INSULATORS
AN (O) PRODUCT

OWENS-ILLINOIS
GENERAL OFFICES · TOLEDO 1, OHIO

New . . . Different . . . Better

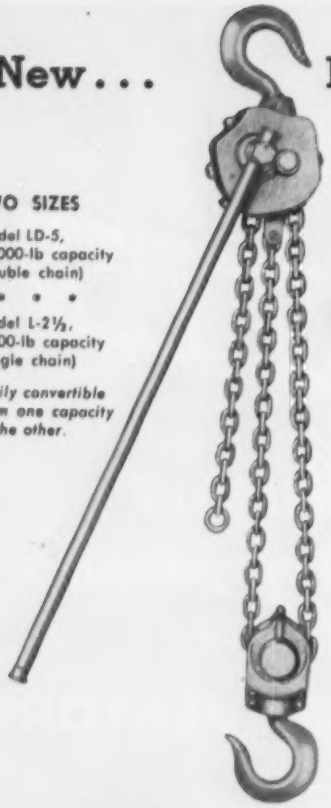
TWO SIZES

Model LD-5, 10,000-lb capacity (double chain)

• • •

Model L-2½, 5,000-lb capacity (single chain)

Easily convertible from one capacity to the other.



COFFING

Super Power

COIL CHAIN

RATCHET LEVER HOIST

For over two years the entire production of Coffing's new Super Power Ratchet Lever Hoist has gone into military service. Now it is available to bring new standards of ratchet hoist performance to civilian users. These are just a few of the advantages this new hoist offers:

SIMPLE in design

Parts are simple, rugged and few in number to assure continued top performance. May be disassembled in the field for fast, efficient servicing.

The only 5-ton hoist of this type using but two chains, contributing to faster operation and lighter weight.

CONVENIENT to use

Handle adjustable for close-quarter applications — also may be operated from opposite side of hoist.

The 5-ton model weighs but 58 lb — lightest weight ratchet hoist in this capacity on the market.

Only 70 lb of handle pull needed to lift 10,000 lb with patented compound lever principle.

You get coil chain flexibility plus free chaining for quick adjustment.

TOUGH for safety and dependability

Ratchets and pawls are specially hardened alloy steel — *every* load-holding ratchet is tested at 30,000 lb.

Housing is certified malleable iron to protect hoist from rust and damage.

Handle is designed to bend before hoist is overloaded beyond safe limits.

For full details, write for Bulletin E10L.

IN PUNISHING "DROP TEST," the Super Power had to withstand the shock of a 10,000-lb load dropped 4 in.— *an impact load of over* 40,000 *lb.* After several hundred such tests of Super Powers, there has never been a hoist failure!

COFFING HOIST COMPANY • DANVILLE, ILLINOIS

Originators of the Ratchet Lever Hoist

QUIK-LIFT ELECTRIC HOISTS • HOIST-ALLS • MIGHTY-MIDGET PULLERS • SPUR-GEAR HOISTS
DIFFERENTIAL CHAIN HOISTS • LOAD BINDERS • I-BEAM TROLLEYS

the Series 400 Capacitrols, from On-Off to proportioning stepless types. Wheelco Instruments Div, Barber-Colman Co, Rockford, Ill.

● **RECORDERS:** Bulletin OP1505 (4 pages) shows electrical and mechanical operation recorders. Bristol Co, Waterbury 20, Conn.

● **SERVO:** Bulletin 54B (4 pages) shows a precision servo system for instrumentation in remote transmission of motion. Richardson Scale Co, Clifton, N. J.

● **CHAIN:** Quick Facts About Chain 4 pages, gives specifications and load limits for alloy steel chain. Joseph T. Ryerson & Son, Inc, Box 8000-A, Chicago 80, Ill.

● **PLASTICS:** Chart gives government specifications for 24 grades of thermosetting laminated plastics. Synthane Corp, Oaks, Pa.

● **CERAMICS:** A 4-page bulletin gives electrical and mechanical properties of standard grades of electrical ceramics and recommended applications. General Ceramics Corp, Keasbey, N. J.

● **GASKETS:** Bulletin PK-80A (6 pages) shows chemically-resistant Chempac (Teflon-asbestos) packings and gaskets. Johns-Manville, 22 E. 40 St, New York 16, N. Y.

● **FRANGIBLE DISCS:** A series of 30 catalog sheets cover the variety of uses in protection of pressure systems by frangible discs. Frangible Discs, Inc, 57 Railroad Ave, Penns Grove, N. J.

● **CAPACITORS:** Bulletin Sheet 158 shows booted terminal ac motor capacitors, Type MKV, 3 to 20 uf, 236 to 660 v ac. Cornell-Dubilier Electric Corp, South Plainfield, N. J.

● **GREASING:** Catalog sheet shows grease equipment for gear lubricants. John Wood Co, Muskegon, Mich.

● **LUBRICANTS:** Four-page bulletin 50-754 covers Gredag lubricants (containing graphite). Gredag Inc, Niagara Falls, N. Y.

● **TOOL CATALOG:** Catalog 5418 (40 pages) gives attachments and accessories for lathes, drill presses, shapers, and grinders. South Bend Lathe Works, 425 E. Madison St, South Bend 22, Indiana.

● **MASONRY DRILLS:** A 4-page folder shows rotary concrete core drills, ⅜ to 6-in. diam. Tilden Tool Mfg Co, 6657 N. Clark St, Chicago 26, Ill.

● **CONNECTORS:** Distribution and service connectors, copper and aluminum, compression and bolted, are shown in Bulletin 71, 22 pages. Thomas & Betts Co, Inc, Elizabeth 1, N. J.

● **ANCHORING:** A 4-page bulletin shows use of Cerro alloys (bismuth) to anchor bearings, bushings, and non-moving parts in machinery. Cerro De Pasco Corp, 40 Wall St, New York 5, N. Y.

● **WELDING:** Catalog ADJC662B, 50 pages, covers cutting and welding products, gas and arc. Catalog 818, 36 pages, covers hand torches for gas cutting and welding, along with tips and accessories. Air Reduction, 60 E. 42 St, New York 17, N. Y.

● **BULLETIN BOARDS:** Catalog sheet shows mahogany bulletin boards. Industrial Products Co, 2820 N. Fourth St, Philadelphia 33, Pa.

● **PIPE MARKERS:** Bulletin 135B (6 pages) shows pipe markers that stick from —300 to 300 F. W. H. Brady Co, 727 W. Glendale Ave, Milwaukee 12, Wis.

● **QUICK CEMENT:** Data sheet covers Garonite instant-setting cement for anchoring fixtures, machinery, etc. Garon Products Co, 37 S. 13th St, Philadelphia 7, Pa.

HERE'S REAL *Versatility* IN OUTDOOR LIGHTING CONTROL

THE FISHER-PIERCE
SERIES 64400 PHOTOELECTRIC CONTROL

This control embodies the proven, dependable F-P basic circuit, in a simple, compact form. Mounting versatility of this unitized control is represented in the adaptions to various manufacturers' luminaires illustrated here, as well as ballast, pole top, cross arm, standard and other mountings.

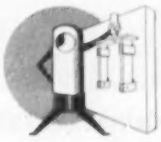
Versatility of the Series 64400 Control is equalled by its economy. Low initial cost, savings in wiring, labor and materials, as well as low maintenance cost, make it economically practical to use one F-P 64400 Control per lamp.

Complete Descriptive Data on Request

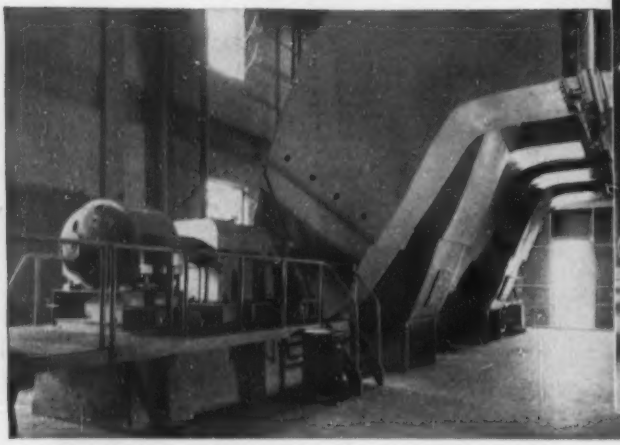
THE FISHER-PIERCE CO.,
82 Pearl Street, So. Braintree, Boston 85, Mass.

EXPORT: PHILLIPS EXPORT CORP.
DIVISION OF NORTH AMERICAN PHILLIPS
100 E. 42ND STREET
NEW YORK 17, N. Y.

IN CANADA:
NORTHERN ELECTRIC
CO., Ltd.

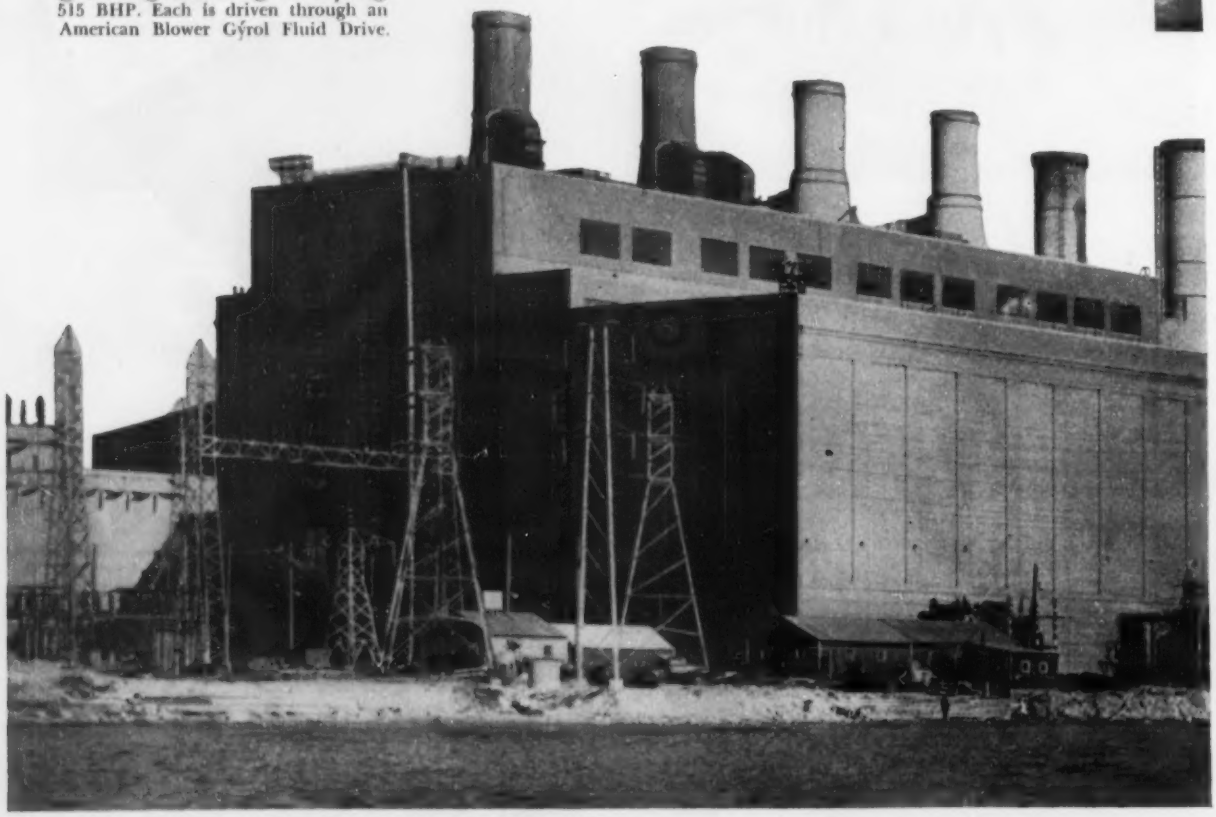


Niagara Mohawk expands



Installed at Niagara Mohawk's Oswego Station are two American Blower Induced Draft Fans, rated 181,000 cfm @ 310°F @ 14.0" SP @ 1150 rpm @ 515 BHP. Each is driven through an American Blower Gyrol Fluid Drive.

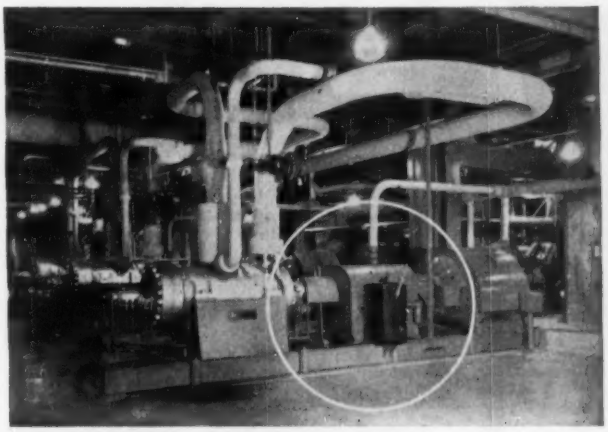
Installed at Dunkirk Station are American Blower secondary air fans with inlet vane control. Rated capacity, 112,000 cfm, 12" wg, 1190 rpm.



Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL

capacity to 2,682,000 kw

American Blower
Reports on Progress in Power



American Blower Gyrol Fluid Drives control the speed of Boiler Feed Pumps at Dunkirk Steam Station. Rated capacity of each Fluid Drive is 1,250 hp at 3,500 rpm. Niagara Mohawk also uses Gyrol Fluid Drives for fan control.

Niagara Mohawk Power Corporation is one of the world's largest private producers of electrical power. With 84 hydro-electric and seven steam-electric stations, Niagara Mohawk serves a 22,000 square-mile territory in New York State, and supplies electricity to 3,100,000 people.

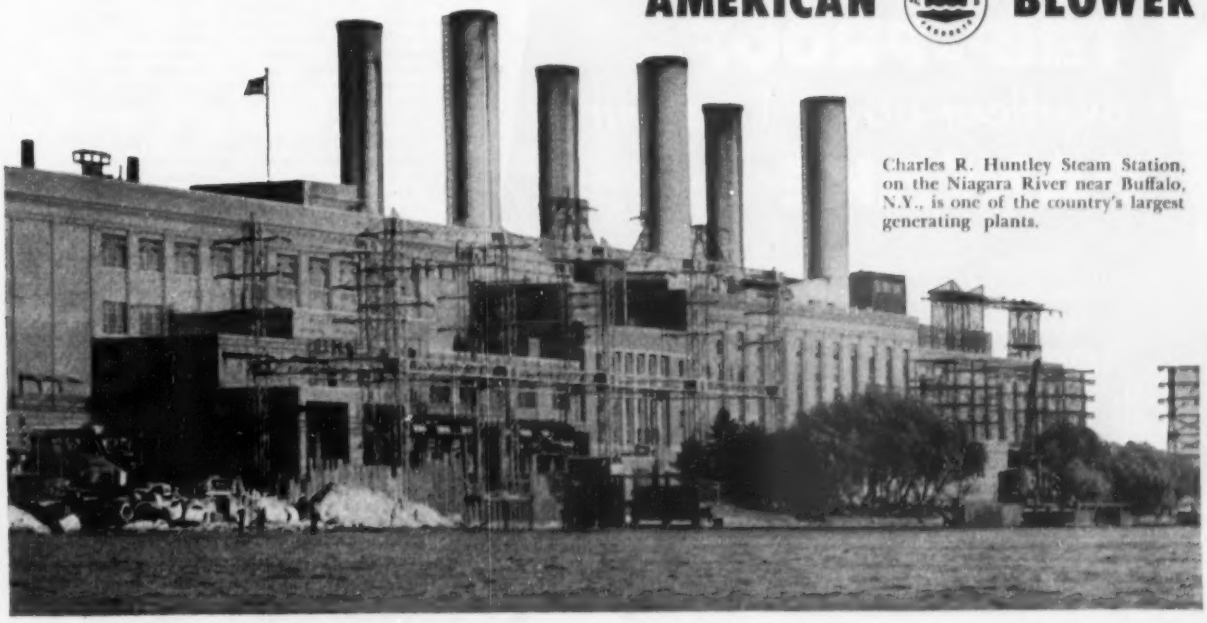
To keep pace with the growing power needs of its customers, Niagara Mohawk has spent a total of nearly $350,000,000 for new and expanded facilities since the war. During 1953 and early 1954, approximately 300,000 kw of generating power were added, bringing the system's total rated capacity to a mighty 2,682,000 kw.

American Blower has played an important role in this expansion program. It has supplied many of Niagara Mohawk's Stations with Mechanical Draft Fans and Gyrol Fluid Drives for boiler feed pump and fan control. Recognized for its dependability and economy of operation, American Blower equipment — including Dust Collectors, Fly Ash Precipitators and Heavy Duty Steam Coils, is used extensively in power plants throughout the country.

If you are planning to expand or modernize your facilities, get in touch with your nearest American Blower Branch Office, or write us direct. We will be pleased to work with you on your air-handling problems.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, CANADA
Division of American Radiator & Standard Sanitary Corporation

AMERICAN BLOWER



Charles R. Huntley Steam Station, on the Niagara River near Buffalo, N.Y., is one of the country's largest generating plants.

TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS

WIDELY ADAPTABLE
Fluorescent and Slimline Units

For cove, cornice or valance lighting . . . or supplementary lighting on shelves, counters and display cases, you'll find these Wiremold Units the most useful you've ever worked with. Easily and quickly installed . . . small cross section. Write for full information.

WIREMOLD builds better business for you . . . at a profit!

TRIP-PROOF
overfloor power lines with
PANCAKE

Carries power or communication lines over floor to the point of use . . . *safely!* Strong as a bridge, too — *both* cover and base are heavy galvanized steel. Two interconnecting sizes meet all requirements. Write today for the PANCAKE booklet.

WIREMOLD products are backed by a firm guarantee. See page 7 of Wiremold Catalog No. 19.

The WIREMOLD Company
HARTFORD 10, CONNECTICUT

TECHNICAL LITERATURE

INDUSTRIAL FILMS—The 1954 supplement to the Industrial Film Bibliography names 240 new films available for business and industrial presentation. The bibliography covers motion pictures, sound slidefilm, and silent filmstrip. Price for the supplement, $1.00; both Industrial Film Bibliography and supplement, $2.00.

AMERICAN STANDARDS: Following are available from American Standards Assn, Inc, 70 E. 45 St, New York 17, N. Y., or from American Institute of Electrical Engineers, 33 W. 39 St, New York 18, N. Y. (EW, Aug. 30, 1954, p. 59):

- C37.4—1953 Alternating-Current Power Circuit Breakers. 16 pages, 60¢
- C37.5—1953 Methods for Determining the Rms Value of A Sinusoidal Current Wave and A Normal-Frequency Recovery Voltage and for Simplified Calculation of Fault Currents. 12 pages, 60¢
- C37.6—1953 Schedules of Preferred Ratings for Power Circuit Breakers. 6 pages, 40¢
- C37.9—1953 Test Code for Power Circuit Breakers. 13 pages, 60¢

NEMA STANDARDS — Following are available from National Electrical Manufacturers Assn, 155 E. 44 St, New York 17, N. Y.:

- IC1—1954 Industrial Control. Revises and supersedes the 1949 edition; covers (1) control devices, (2) controllers for motors, cranes, machinery, etc, (3) high-interrupting-capacity low- and high-voltage controllers, (4) dc controllers, and (5) control centers. 120 pages, $6.00
- SG3.1—1954 Network Protectors. Concerns the rating, manufacturing, and application of network protectors. 24 pages, $2.50
- TR1—1954 Transformers. Contains standards covering rating, performance, testing, manufacturing, lead markings, and connections of single-phase transformers rated 3 to 33,333 kva and 3-phase transformers rated 9 to 100,000 kva. 80 pages, $3.00

GAS-TURBINE BIBLIOGRAPHY—Bibliography of Books and Published Reports on Gas Turbines, Jet Propulsion, and Rocket Power Plants, by Ernest F. Fiock and Carl Halpern, Supplement to National Bureau of Standards Circular 509. This supplement, listing 5,000 references, extends coverage of the original circular through December, 1953. 110 pages, 50¢. Government Printing Office, Washington 25, D. C.

CORROSION BIBLOGRAPHY—1948-1949 Bibliographic Survey of Corrosion, 8½ x 11 in., 346 pp, 1954, summarizes 3512 corrosion and corrosion prevention articles, books, and brochures. Literature is covered in 8 main groups: general, testing, characteristic corrosion phenomena, corrosive environment, preventive measures, materials of construction, equipment, and industries. Topical cross-references are appended to each section. Author index contains 2,700 names. Price, $12.50. National Association of Corrosion Engineers, 1061 M&M Bldg, Houston 2, Texas.

EARTHING EQUIPMENT—Publication 335, 40 pages, catalogs and discusses earthing equipment. British Insulated Callender's Cables Ltd, 21 Bloomsbury St, London WC1.

POWER GENERATION AND CONVERSION IN STEEL MILLS (GER-892), 10 pages, is reprinted from Blast Furnace and Steel Plant. General Electric Co, 1 River Rd, Schenectady 5, N. Y.

RADIOGRAPHY—Booklet 31B8121 (8 pages) shows the planning and construction of an industrial 22-Mv betatron radiography laboratory. Allis-Chalmers Manufacturing Co, 932 S. 70 St, Milwaukee, Wis.

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Ebonized Asbestos

K&M Ebonized Asbestos is used for the mounting panel in Cutler-Hammer's Magnetic 2-speed auto-transformer type starter.

In the starter for marine applications that you see pictured above, Cutler-Hammer, Inc. has found that K&M Ebonized Asbestos is right for the job. In panels such as these with a need for strength and resistance to shattering, K&M Ebonized Asbestos fills the bill.

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BOOKS

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Management in the Public Service. By John D. Millett. Published by McGraw-Hill Book Co, Inc, New York 36, N. Y. 417 pages. Price $5.50

Electroacoustics. By Frederick V. Hunt. Published by John Wiley & Sons, Inc, New York 16, N. Y. 260 pages. Price $6.00

Betrieb und Anwendung von Leistungs—und Regeltransformatoren. By F. Ande. Published by Springer-Verlag, Berlin W 35, Germany. 319 pages. Price 33 DM

Nuclear Reactors for Industry and Universities. By E. H. Wakefield. Published by Instruments Publishing Co, Pittsburgh 13, Pa. 93 pages, illustrated. Price $2.00

Electric Power Stations. 4th Edition. By T. H. Carr. Published by Chapman & Hall Ltd, London, England. 605 pages, illustrated. Price 70s. net

General Electricity. By E. W. Jones. Published by McKnight & McKnight Publishing Co, Bloomington, Ill. 120 pages, illustrated. Price $1.25

Perceptualistic Theory of Knowledge. By Peter Fireman. Published by Philisophical Library, Inc, New York 16, N. Y. 50 pages. Price $2.75

Television. 2nd Edition By V. K. Zworykin and G. A. Morton. Published by John Wiley & Sons, Inc, New York 16, N. Y. 1038 pages, illustrated. Price $17.50

Water Conditioning for Industry. By Sheppard T. Powell. Published by McGraw-Hill Book Co. 548 pages, illustrated. Price $9.00

Alternator Cooling

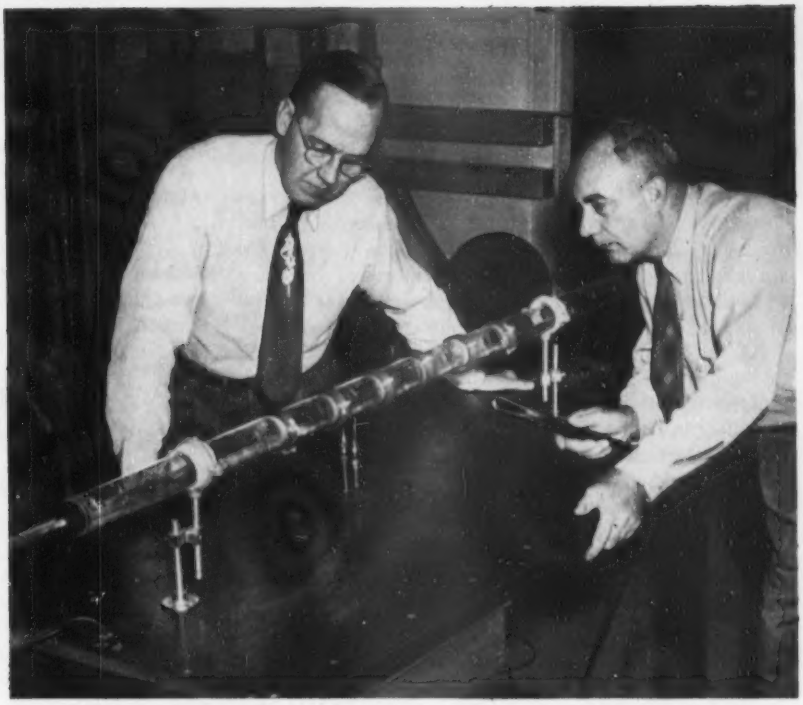
Erwarmung und Kuhlung Electrischer Maschinen. By G. Gotter. Published by Springer-Verlag, Berlin W 35. 328 pages, illustrated. Price DM 34.50

Thorough analysis of heating and cooling of electrical machines is the scope of this book. Principles of heat transmission and transfer in the metallic, insulation, and liquid portions are expounded and many examples and data from the design field are interspersed along the way. Intermittent loading and cooling are treated and so are the matters of temperature distribution and insulation life. Cooling of generators by water is mentioned but not detailed.

A Textbook on Lighting

Illumination Engineering. By Warren B. Boast. Published by McGraw-Hill Book Co, New York 36, N. Y. 340 pages, illustrated. Price $7.00.

This is a second edition. It includes the fundamentals of illumination, terminology and devices and their engineering applications. It discusses the engineering methods of design of both interior and exterior lighting systems. This revision brings up-to-date the material dealing with illumination devices. New material has been added on color, also a chapter on wiring design for illumination systems. This text is useful to students of electrical engineering and architecture.



Zone Refining apparatus, showing tube and induction-heating coils. For transistors—tiny electronic amplifiers—germanium is made extremely pure. Then special impurities are added in controlled amounts for best transistor performance.

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To make the most of their revolutionary invention, the transistor, Bell Laboratories scientists needed ultra-pure germanium.

The scientists solved their problem by devising a radically new refining process. The germanium it yields may well be the purest commercially produced material on earth.

It has only *one part in ten billion* of impurities harmful to transistor performance. That's about the same as a pinch of salt in 35 freight cars of sugar.

Yet the new process, Zone Refining, is simple in principle. An ingot of germanium is drawn through a series of induction-heating coils that melt narrow zones of the substance. Since impurities are more soluble in the liquid than in the solid form of a metal, the molten zones collect impurities. They are swept along by the successive melts to the end of the ingot, which is finally cut off.

Zone Refining is also being applied to the ultra-purification of other materials useful to telephony. This single achievement of research at Bell Telephone Laboratories clears the way for many advances in America's telephone system.

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IMPROVING AMERICA'S TELEPHONE SERVICE PROVIDES CAREERS
FOR CREATIVE MEN IN SCIENTIFIC AND TECHNICAL FIELDS

Readers Forum

(Continued from page 56)

Some Contractors Are Business Shy

To the Editor:

The editorial, "It's a Grass Roots Job," was a timely one. The utility, the manufacturer, the distributor, the dealer, the electrical contractor, and the journeyman electrician are all pointing their finger at other members of the industry and saying, "He's the fellow who is causing all the trouble."

As the various representatives of these groups come through my office during the work day, we discuss this problem with them. They all admit it, but none seems to be willing to be the first to join the church.

I just returned, about ten minutes ago, from a photographer who operates out of his home, where I had taken pictures to be developed. On my first visit last week we discussed his low voltage problem, and I spent the next 30 minutes selling him on the recommended minimum standards set by the National Home Builders Association —three #2 conductors, 1¼" conduit, etc.

At my suggestion, he has asked for bids from four contractors. He reported today that they all wanted to know why he wanted #2 wire for when #8 will do the job; why should he install extra capacity. It so happens I know he plans, in the next year or two, to install an electric clothes dryer (4 kw), an electric range (12 kw), and a 1-ph, 220-v room air conditioner. Apparently I did a good selling job as he told me the man who will get the business will be the fellow who will put in what I recommended. I know and you know that he is an exception.

We recently induced a builder of 144 homes in Fresno to wire them to meet the adequate wiring standards in order that certificates could be issued for each house. The additional cost of each house was $155. The contractor, who gave the bid for adequate wiring and who helped sell the job and ultimately got it, reported that his competitors quoted a lower price and said adequate wiring was not necessary.

In my humble opinion we will have to start at the foundation, which is the journeyman electrician, and the union, nationally, is going to have to sell its membership. Many of these fellows ultimately become contractors. Then the rest of us will have to work on the manufacturer, distributor, dealer, electrical contractor, and utility.

Keep writing your editorials. I understand they have been printing Bibles for years—you will make a convert every once in a while.

Hopeful

A Co-op Manager Asks Questions

To the Editor:

I don't understand. Your "Washington Comment" of Aug. 23 (p 102) indicates that administration of the Rural Electrification program has cost the taxpayer some 80 million in the past 17 years "for which there is no prospect of direct return to the treasury." How about the indirect return or interest income to the government during that time? Or were net figures quoted from the comptroller's report? Your article wasn't exactly clear on this matter.

It is my impression that interest income to the government exceeded cost of money to the government during the period in an amount sufficient to more than offset costs of administration—to say nothing of the social and economic benefits derived from the program. How about it? Isn't there another aspect to this situation which was overlooked in your article?

Howard E. Helmers,
Manager

Graham County Electric Cooperative, Inc.
Post Office Box 1297
Pima, Ariz.

"Progress with Electricity"—A Slogan

To the Editor:

Have just finished reading the editorial on page 78 of the Aug. 9 issue entitled, "Industry Slogans—An Industry Job." But why restrict the need for an over-all slogan to the electric utility industry alone, why not include the electrical manufacturing industry as well and come up with one slogan suitable for promoting the efforts of the entire electrical industry.

I suppose just as many slogans could be conceived as there are fertile minds working on the problem. But now for a starter, just pulled out of thin air, "Progress with Electricity."

A. L. Carvill
Manager—Electric Utility Field Sales

General Electric Co
Somersworth, N. H.

Better Than Adequate Wiring?

To the Editor:

Your July 12 issue (p 188) indicated an interest in comments on the continued use by the industry of the expression, "adequate wiring." In my humble opinion a new term, more in keeping with the current cost and utility of electrical installations, is needed.

The weakness of "adequate wiring" lies in the noun; whereas proposals for improvement seem to be all directed toward changing the adjective. "Wiring" was probably a suitable description of early electrical installations but is as outmoded as are those installations today. There is nothing about the word to convey the impression that a good electrical installation contains carefully engineered parts assembled as a whole to provide safely and conveniently for ever increasing electrical requirements.

As a suggestion, why not substitute "electrical system" which seems to give today's installation the dignity it deserves. There is no lack of adjectives to use with this expression, and a statement, for instance, that a house has a modern electrical system seems far more expressive than a statement that the house has adequate wiring.

C. S. Alger
Engineer

Puget Sound Power & Light Co
P. O. Box 1879
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Central P&L Makes Top Changes

J. L. Bates is elected president and will continue as general manager. He succeeds Lon C. Hill, who becomes chairman

J. L. BATES

At a board of directors' meeting held in Corpus Christi, Tex., recently, J. L. Bates was elected president of the Central Power & Light Co. He succeeds Lon C. Hill who was named chairman of the board.

Hill has been president since 1939 and Bates has been vice president and general manager since 1940. Bates will continue to serve as general manager.

Former Division Manager . . . Bates, after serving overseas with the Army in World War I, engaged in silver mining and contracting before joining Central P&L in 1923. He served as CP&L manager at McAllen and Mission, as distribution engineer and assistant district manager at San Benito, as valley district manager at San Benito, and as vice president and division manager at Victoria before coming vice president and general manager in 1940.

Investment Banker . . . Hill attended the University of Texas and during World War I served in the Army Air Corps. He was engaged in farming, land management, and investment banking before becoming president of CP&L. He spent seven years working for A. C. Allyn & Co. in Chicago.

Kimball Joins Idaho Power

John T. Kimball, executive vice president of the Arizona Public Service Co, has resigned to become vice president and general manager of the Idaho Power Co.

JOHN T. KIMBALL

He took over his new duties on Oct. 1, replacing T. E. Roach as general manager. Roach will continue as president and chairman of the board of the Idaho Power.

Began Utility Career in 1934 . . . Kimball started his utility career in 1934 with the Mississippi Power & Light Co and in 1935 he was named supervisor of residential sales activities for the Jackson Division. In 1945 he joined the Central Arizona Light & Power Co as manager of research and development. He was appointed assistant to the president in 1947 and in 1948 he was named vice president of the Arizona Public Service Co, which was formed through the merger of Calapco and the Arizona Edison Co.

McDaniel Made Manager of Technical Information

H. C. McDaniel has been appointed manager of technical information for the Westinghouse Electric Corp.

McDaniel, formerly manager of technical publicity, will supervise both technical publicity operations and Westinghouse Engineer magazine. He replaces C. A. Scarlott, former technical information manager and editor of the Engineer, who has resigned to accept the position of manager of technical information services at the Stanford Research Institute, Palo Alto, Calif.

McDaniel joined Westinghouse in 1939 as a commercial engineer at the company's Lamp Division in Bloomfield, N. J. In 1943 he was assigned to the technical information office in Pittsburgh, and became manager of technical publicity in 1948.

Scarlott came to Westinghouse in 1926, a year after his graduation from the University of Arizona. He has been editor of the Westinghouse Engineer since it was founded in 1941 and has headed the technical information office since 1951.

•

Evelyn Pitschke, Indianapolis attorney, has been named the first feminine hearing examiner for the Indiana Public Service Commission. She replaces **William Stuckney** who resigned.

Col H. George Gerdes (U. S. Army-Ret.) has been appointed power engineer for Kaiser Engineers Division of Henry J. Kaiser Co. He will be assigned to firm's hydro development program.

Robert L. Bell, formerly superintendent of metals, Carboloy Department of General Electric Co, has been appointed manager of manufacturing engineering. Prior to coming to Carboloy in 1939, Bell was affiliated with Bates & Rogers Construction Co and the Carboloy component of the Cleveland Wire Works.

William C. Beattie has been made manager of the production department of the Consolidated Edison Co of New York, Inc, replacing **Jefferson C. Falkner** who retired October 1. Beattie joined the Con Edison in 1927.

FIRE!

Put it out in seconds with a Kidde portable extinguisher!

When fire strikes, there's just one thing to do – Put it out *fast!* That's why it's so vital to have Kidde portable extinguishers near every fire hazard . . . because Kidde portables, with their special fast-acting trigger release, are made to swing into action at a moment's notice.

You just grab a Kidde CO_2 or Dry Chemical portable, aim the horn, and pull the trigger. Whoof! The fire's smothered right in its tracks!

And don't forget the big hazards like motors, generators, switch gear. See that *they* get the built-in protection of a Kidde *Fully Automatic* CO_2 Fire Extinguishing *System.*

Don't wait – Contact Kidde today!

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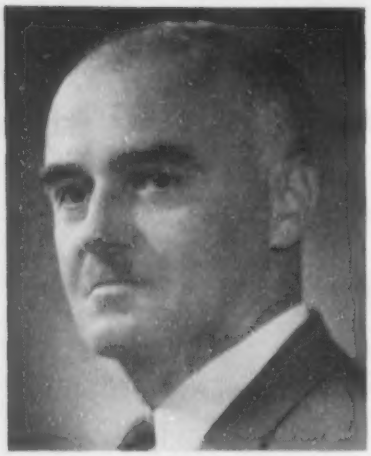


DUNCAN M. JONES

Jones Elected President of IES for 1954-1955

Duncan M. Jones, Curtis Lighting Co of Canada Ltd, Montreal, has been elected president of Illuminating Engineering Society for 1954-55. He is the first Canadian to be elected by the soceity.

Jones was born and educated in Montreal. His enrollment in McGill University in 1916 coincides with his country's need for young men for the first World War. While waiting to be called into service, he did some temporary work for the Canadian General Electric Co.

Upon discharge from the service in 1919, he returned to Canadian GE in Montreal and devoted the following five years to studies of illumination, as well as field application of its principles.

In 1925 Jones joined the Holophane Co, Newark, Ohio, as street lighting engineer. He became a familiar figure in this field, appearing before numerous meetings as speaker, serving as chairman of the committee on illumination of the U. S. National Highways Traffic Association. He came to Curtis in 1933.

That year he was instrumental in establishing a Chapter IES group. There, as regional vice president for the Canadian Legion in 1947-49, Jones spearheaded a remarkable growth of IES in Canada and increasing interest in the science of illumination. A noteworthy outcome of this interest was the formation of four new IES chapters in Canada, all during his term as regional vice president. Jones has been a member of the Council continuously since 1947, serving a term also as director to which post he was elected in 1949 and two terms as vice president.

Gale Becomes Manager Idaho Power Operations

Ralph E. Gale, vice president and director of Idaho Power Co, has taken over managerial responsibility for engineering and operations since the retirement of B. C. Russell on August 31. At the same time J. F. Emery who has been assistant to the general superintendent, became superintendent of electrical operations and construction.

Gale joined the Idaho Power Co 33 years ago as switchboard wireman on construction of the Thousand Springs power plant.

Emery did his work for Idaho Power in 1918-19 when he was still in high school. He became distribution engineer in 1937, assistant superintendent of distribution in 1940, assistant electrical superintendent in 1942 and assistant to the superintendent in 1946.

OBITUARY

Martin B. Piggott, 51, secretary and treasurer of the Houston Lighting & Power Co, died on Sept. 15 in Burnet, Tex.

W. W. Trench, 62, retired secretary of General Electric Co, died in Schenectady, N. Y. In addition to being secretary of the company and its advisory committee, he was a trustee or member of the board of all financial subsidiaries and trusts at his retirement.

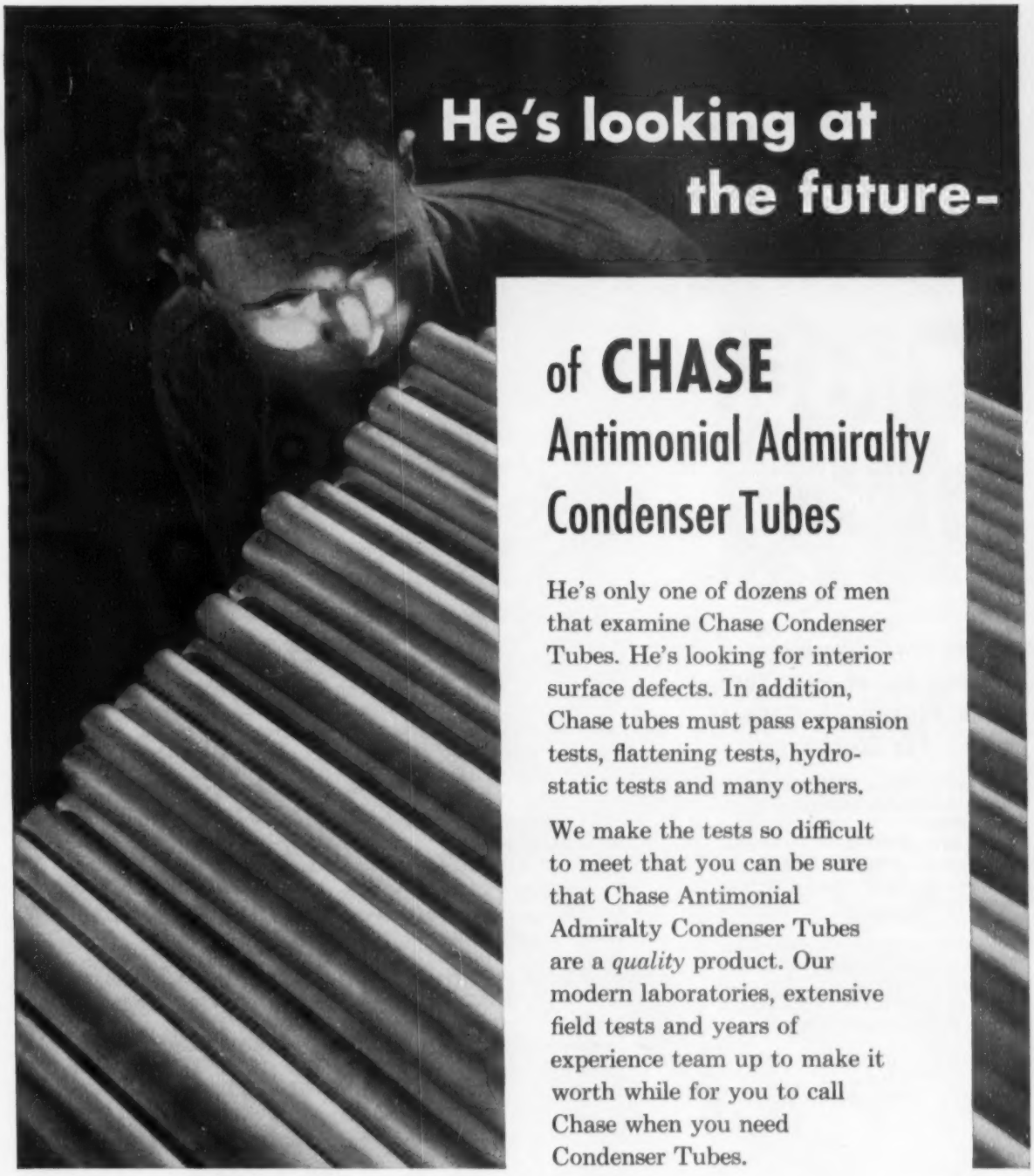
Bernhard G. Tang, 73, who retired in 1945 as general superintendent of the Schenectady Works of the General Electric Co, died in Schenectady on Sept. 17.

George Kirsteen, 67, superintendent of the Wright County Rural Electrification Association, died recently in Clarion, Iowa.

McQuiston Elected New PEA President

Theodore O. McQuiston (center), vice president of Metropolitan Edison Co, is shown receiving congratulations from retiring president John M. Orr (left), personnel director of Duquesne Light Co, as he assumed presidency of the Pennsylvania Electric Association at its 47th annual meeting in Pittsburgh recently.

Looking on is Robert P. Liversidge (right), vice president of Philadelphia Electric Co, who was elected second vice president. Orville E. Flora, vice president of Pennsylvania Power Co, was named first vice president and Joseph O. Chambers, vice president of West Penn Power Co, was made third vice president.



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He's only one of dozens of men that examine Chase Condenser Tubes. He's looking for interior surface defects. In addition, Chase tubes must pass expansion tests, flattening tests, hydrostatic tests and many others.

We make the tests so difficult to meet that you can be sure that Chase Antimonial Admiralty Condenser Tubes are a *quality* product. Our modern laboratories, extensive field tests and years of experience team up to make it worth while for you to call Chase when you need Condenser Tubes.

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DIAMOND "UTILISCOPE"

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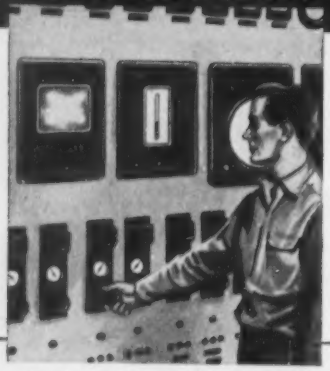

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Since a trial installation in 1947, the Consolidated Edison Company of New York has placed 15 orders for 26 Diamond "Utiliscopes" to improve centralized control. Electric utilities are necessarily critical buyers . . . the nature of their business demands equipment of extreme reliability and good performance.

The "Utiliscope" can give you money by watching important operations which are too remote, too inaccessible, too dangerous, too hot or too costly to watch directly.

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Since 1903, Diamond has Manufactured Quality Equipment for Industry

TVA Bond Issue

. . . to meet authority's growing power demands is suggested by Republican Congressman Baker

A Tennessee Republican Congressman has suggested that TVA be authorized to issue bonds to build dams or steam plants to meet its growing power demands.

Rep Howard H. Baker of Huntsville proposed an amendment to the TVA act authorizing the agency to borrow money and issue bonds or debentures to expand its power system.

Loans to be Self-Liquidating . . . Baker was addressing the Eastern District Power Distributors Association in Gatlinburg, Tenn. The Congressman said such "loans would certainly be self-liquidating."

The Congressman represents the TVA's headquarters district. He said he had found "largely" two things wrong with TVA's relations with Congress.

1. "Why should this $1½ billion corporation with such a large annual income have to come to Congress year in and year out for operating money?

2. "The requests and justifications for appropriations of new money from the United States Treasury should be in simpler and more understandable form and there seems to be a rather general feeling among members of Congress that the conduct of the affairs of TVA were not being fully explained and disclosed to the Congress and to the appropriations committee."

He said TVA had been turned down by both the Democratic-controlled 82nd Congress and the Republican-controlled 83rd Congress on its request for funds to start a steam plant near Memphis. Congressman Baker said:

"An amendment to the TVA act authorizing TVA to borrow money and issue bonds or debentures of sufficient amount to furnish facilities, either hydro or steam generating, to meet the need of its expanding power demands to adequately serve the Tennessee Valley Authority area is well worthy of consideration."

Baker charged that a new move was underway by TVA to move its headquarters from Knoxville, Tenn., to a new location at Muscle Shoals, Ala.

However, officials of Tennessee Valley Authority in Knoxville said this was not true.

FINANCIAL BRIEFS

Cuyahoga Falls, Ohio, City Council has passed an ordinance to issue $900,000 of first mortgage revenue bonds to finance a five-year program of improving and modernizing its municipal electric system.

Ohio Power Co has received Public Utilities Commission of Ohio approval to merge Central Ohio Light & Power Co into it. Ohio Power has purchased the municipal plant at Bluffton, Ohio for $466,500.

Arizona Public Service Co has received Phoenix City Council approval for a new 25-year electric franchise. Election has been set for Oct. 5.

British Columbia Electric Co is planning to sell 200,000 shares of 4½% preferred stock of $50 par value to the public through Nesbitt, Thomson & Co.

Laurance and David Rockefeller have acquired a minority interest in the Nuclear Development Associates, Inc, White Plains, N. Y. The company's important current projects are the nuclear design of a breeder reactor for the Detroit Edison Nuclear Power Group and the development of nuclear reactor for air equipment.

Tacoma Wash., City Light is planning to spend about $11.8 million in 1955 as compared to $12.7 million in 1954.

RATE BRIEFS

Southern Utah Power Co has been denied a rate increase by the Utah Public Service Commission. Dismissing the company's petition "without prejudice," the PSC said "While the rate of return from certain classes of business appears to be somewhat low in relation to other classes, we are of the opinion that no adjustments among the several rate schedules should be made at the present time."

This 3-step insulation gives triple protection year-after-year

A team of "Scotch" Electrical Products makes a simple job of cable splicing

1. 3-PHASE 600 V. cable splice is built up with "Scotchfil" Electrical Insulating Putty. Putty comes in 1½ in. x 5 ft. roll, applies like tape. Moderate finger pressure molds it to eliminate voids and air pockets. Clean and neat.

2. BUILT-UP SPLICE area is wrapped with two half-lapped layers of "Scotch" No. 33 Plastic Electrical Tape. Tape conforms to every contour; gives neat appearance; forms a tough plastic sheath around putty.

3. FOR EXTRA heavy-duty protection against abnormal weathering and moisture conditions, taped splice is then coated with "Scotchkote" Electrical Coating.

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3M

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quickly set anchors in masonry of any thickness, holes in varying depth

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TOOLS FOR CRAFTSMEN

GREENLEE

GREENLEE TOOL CO.

1810 COLUMBIA AVE., ROCKFORD, ILL.

Conductor Bundling

(*Continued from page 70*)

Armor Rods . . . Preformed armor rods were installed. Clipping-in crews were made up of two linemen and two helpers each. Two methods were employed in the installation of the armor rods. With either a set of rope blocks or a mechanical hoist, the top conductor was raised in order to release it from the suspension insulator assembly. This top wire was transferred to and held in this position by a sling attached to the crossarm. The rope blocks were attached to the lower conductor, and this conductor was raised to allow for the removal of the dolly blocks. Armor rods were installed with the conductor in this position. The top conductor was attached to the insulator assembly; then the lower conductor was attached to the separator straps.

A modification of this method is to use a set of rope blocks to which is attached two flat "C" hooks separated by 9 in. This allows the lower conductor to be raised 2 in. before the top conductor is raised and released from the insulator assembly. With this arrangement the entire conductor assembly is raised with one operation.

Spacers . . . Preformed spacers were installed at mid-span in only four spans. This spacer is installed either with a pole attached to a winch truck equipped with an "A" frame or by lowering the conductor-bundled assembly to the ground where possible to do so. Thus far insufficient data are available to determine whether these spacers are necessary. Indications are that the spacers will not be needed.

Labor and Costs . . . Eighteen men (162 man-hours) were the maximum number employed in any one day's operation throughout the 14 working days required to complete this work. The job averaged working ten men per nine-hour day. This figure includes all operations from hauling, spotting, etc, of guard poles, material, and wire at the beginning through final clean-up. On a per mile basis, it amounts to $3,255.

The entire operation was very smooth and the future for successfully employing bundled conductors on the system looks very promising.

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all the U. S. Savings Bonds you buy

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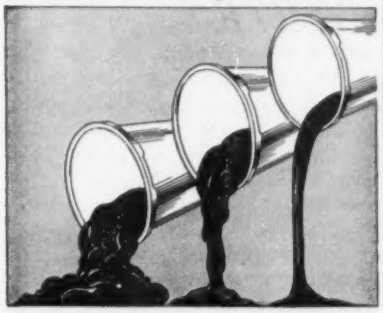

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IRWIN HEX SHANK WOOD BITS

Temperature Affects Load

(*Continued from page 78*)

Load Duration . . . When the temperature-affected load is calculated on punched cards, data for load-duration curves are obtained quite easily. For example, Fig 4 shows the system load duration curves on the two peak days used for Fig 3. The temperature-affected load is indicated by the area at the top of the load.

The load-duration curve for temperature-affected load only during November, 1952, is illustrated in Fig 5. The highest temperature-affected load as well as the system peak 12 months ending March 31, 1953) occurred then. Note that the upper 10,000 kw of temperature-affected load is of very short duration.

By this method the temperature adjustment for normalizing revenues and expenses in rate proceedings may be estimated. If the normal temperature is obtained by averaging the hourly temperatures, say for a ten-year period, the temperature-affected load may be computed by applying the slopes of each hourly line to the degree-hour deficiency at that hour. The same slopes can then be applied to the degree-hour deficiencies in the actual test year. The kwhr difference constitutes the temperature adjustment.

Adjustment in Rate Cases . . . This method of temperature normalization reflects average conditions more accurately than if degree-days are used.

On three days selected at random from weather bureau reports, the average temperature was 49 F. Thus, for each date the degree-day deficiency was 16 below 65 F or 21 below 70 F. The degree-hour deficiencies based on the hourly temperature readings are listed in Table IV. These did not always include the maximum and minimum between hourly readings.

The tabulation shows that use of the degree-day unit suggests the temperature, as it affected electric use, was the same each day. But the more refined degree-hour unit indicates that Jan. 15 was 21% colder than Jan. 2 on the same 65-F base, while Jan. 28 was 30% colder. By applying to the hourly degree-hour deficiencies below 70 F on these three days the corresponding slopes from calculated data for Case 4 for the respective hours on weekdays and Sundays, different percentages result.

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- **smooth edges can't cut lineman's gloves, nick conductors**
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50 YEARS OF TECHNICAL KNOW-HOW

FREE SAMPLE upon request. Write today!

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DOSSERT MFG. CORP.
249 HURON STREET, BROOKLYN 22, N. Y.
SINCE 1904

The Reader AUDITED PAID CIRCULATION ABC *His Mark*

THE ABC SYMBOL, which appears at the head of this page, is your brand—the reader's brand—on this magazine. It stands for Audit Bureau of Circulations. It means that this magazine will stay in business only so long as it continues to serve its readers to their satisfaction.

That Bureau—known for short as ABC—is a voluntary, nonprofit, cooperative association founded in 1914 by a group of publishers, advertisers and advertising agencies who wanted to establish and maintain higher standards of publishing practices than then prevailed. Its primary and specific purpose was to set up yardsticks to appraise circulation values and to verify the claims of publishers as to their circulations. For the buyer of advertising space this provides an effective means to take some of the guesswork out of buying and to reconcile the conflicting claims of competing publishers. BUSINESS WEEK magazine has aptly described ABC as "the publisher's conscience—and cop."

BUT IN DOING that job, ABC performs another function of high importance to the readers of ABC member publications. It provides a constant pressure on the publishers to keep alive in their staffs a sense of primary responsibility to their readers. That is because the most simple and direct method of making a publication responsible to its readers is to place upon it a purchase price, whether by subscription or newsstand purchase. The right to purchase or to refrain from purchasing a publication gives to the reader and to no one else the power to pass effective judgment on the publisher's success in serving the reading public. Each paid publication will grow or languish, will prosper or fail, in proportion as it wins or loses the following of thousands or millions of readers. The readers, by their patronage, record their judgments as to whether the publisher and his publication are measuring up to their responsibility to them.

And that is where the ABC comes into the reader's picture. The newspaper or magazine that carries the ABC symbol on its masthead must in the first place be a paid circulation publication. Moreover, it must conform to the high standards set up by the Bureau as to terms of payment and accounting methods. And again it must open all of its books to the auditors of the Bureau on demand.

SINCE THE INFORMATION thus determined by thorough and impartial audit is periodically made public through the ABC statements and audit reports, it is constantly available to and universally used by advertisers who are considering the purchase of space in an ABC publication. These reports show the circulation trend, as verified and certified by ABC, and thus put the advertisers in a position to know whether or not the publisher is rendering satisfactory service to his readers.

Thus the publisher who submits his publication to the supervision and discipline of ABC affirms in the strongest possible manner that he recognizes his primary obligation is to his readers and that he owes his standing to a voluntary demand by those readers. It follows that the editors of ABC publications must be exceptionally alert to the desires of their readers and responsive to their needs, since any decline in circulation will soon show up in the ABC statements and audit reports.

THAT IS WHY we describe the ABC symbol as the reader's brand. It shows that a publication must be primarily responsive to him and that he holds in his own hands its success or failure. And that ABC symbol is not only a constant reminder to him of that fact, but also an equally constant reminder to all concerned that the reader's willingness to pay for the ABC publication is the acid test of its value to him and to the advertiser.

McGraw-Hill Publishing Company, Inc.

To Study B. C. Site

Kaiser Aluminum gets British Columbia's permission to explore Arrow Lakes area

Kaiser Aluminum & Chemical Corp has reached an agreement with British Columbia government officials which will permit Kaiser Aluminum to proceed with engineering and development plans for a $25-million, low-level Arrow Lakes dam.

The dam would be located in Castlegar Narrows at the foot of Arrow Lakes on the Columbia River, 24 miles north of the Canadian border.

Water for U. S. Power Units . . . The project calls for construction and maintenance of a dam with reservoir storage capacity of 3-million acre ft. Water would be released as required for power generation through downstream power facilities in the U. S.

N. L. Krey, Kaiser Alumium's Northwest operations manager, confirmed that his company had posted a substantial bond to secure assurance to construct the Arrow Lakes project, pending completion of studies.

The company is committed to spend at least $100,000 on surveys before March 1, 1955, or a proportionate amount in case nonfeasibility is determined sooner. If investigations are successful, Kaiser Aluminum will form a Canadian company before March 1, 1955, which will apply for a conditional water license to permit construction. Upon completion of the dam, a final, 50-year license under provisions of the "Water Act" will be issued by the B. C. government.

B. C. to Get $1 Million Yearly . . . Revenues to British Columbia are expected to amount to some $1 million in fees and taxes yearly. Water rental to be collected by British Columbia will be in terms of electrical energy to equal 20% of the kilowatthours which could be generated at downstream plants of the U. S. government from the net storage created by the dam. This energy will be collectable at the border at a point on Bonneville Power Administration system. If Kaiser is unable by reason of any law or order to deliver the power to British Columbia, the value of such power will be paid the B. C. government by the Canadian company.

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GRIP-TITE MANUFACTURING CO.

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Advertising in This Issue

Allen-Bradley Co. 19, 20
Allis-Chalmers Mfg. Co.....2nd Cover
12, 13, 30, 38, 48, 49, 117
American Blower Corp.....154, 155
American Creosoting Co..... 36
Anaconda Wire & Cable Co...118, 119
Automatic Switch Co..... 106

Bell Telephone Laboratories..... 159
Bethlehem Steel Co..... 139
Blackburn Corp., Jasper..... 113
Bristol Co., The..... 34
Brown Co. 136
Burndy Engineering Co., Inc..... 27
Bussmann Mfg. Co.....24, 25

C-O-Two-Pyrene 21
Cable Spinning Equipment Co.... 150
Chance Co., A. B.....97, 134
Chase Brass & Copper Co..... 165
Coffing Hoist Co..... 152
Cole Electric Co..... 176
Copperweld Steel Co..... 9
Crouse-Hinds Co. 39

Diamond Power Specialty Corp... 166
Directory of Engineers..... 173
Dossert Mfg. Corp..... 169
Driver-Harris Co..... 51

Eastern Specialty Co..... 142
Ebasco Services, Inc..... 14
Electric Service Mfg. Co.....44, 45
Electric Storage Battery Co..... 10
Electroline Company 5
Electromode Corp. 171
Engineers, Directory of..... 173
Erico Products, Inc..... 35
Everstick Anchor Co..... 110

Federal Pacific Electric Co...3rd Cover
Fisher-Pierce Co., The..... 153
Fitchburg Engineering Corp..... 133
Foushee & Heckendorn..... 171

G&W Electric Specialty Co..... 109
General Cable Corp. 42
General Electric Co.,
Apparatus Dept....40, 41, 86, 87, 89
90, 91, 92, 93
Electronics Div. 26
Lamp Div. 107
Green Fuel Economizer Co..... 138
Greenlee Tool Co..... 168
Grinnell Co., Inc..... 148
Grip-Tite Mfg. Co..... 171

Hazard Insulated Wire Works.... 4
Holan Corp., J. H..... 43
Hubbard Aluminum Products Co.. 141

Ideal Industries, Inc..... 149
Indiana Steel & Wire Co..... 168
Irwin Auger Bit Co..... 169
I-T-E Circuit Breaker Co.
R&IE Equipment Div.....16, 17

KPF Electric Co..... 46
Keasbey & Mattison Co..... 157
Kerite Co., The..... 52
Kidde & Co., Inc., Walter..... 163

Kimble Insulator Co., sub of
Owens-Illinois 151
Koppers Co., Inc..... 31
Kuhlman Electric Co.....4th Cover

Lapp Insulator Co., Inc..... 23
Locke Dept. General Electric Co.. 37

Mallory & Co., Inc., P. R..... 8
McCabe-Powers Auto Body Co... 18
Minerallac Electric Co..... 169
Minnesota Mining & Mfg. Co..... 167
Moloney Electric Co.....98, 99
Motorola Communications & Electronics, Inc. 161

Ohio Brass Co.....101, 102, 103, 104
Okonite Co., The..... 4
Osmose Wood Preserving Co., Inc. 168

Page Steel & Wire Div., Amer.
Chain & Cable Co..... 146
Pennsylvania Transformer Co..28, 29
Porcelain Products, Inc..... 158
Pyrene-C-O-Two 21

Radio Corp. of America..... 47
Reliable Electric Co.....144, 145
Revere Copper & Brass, Inc..... 95
Richardson-Allen Corp..... 105

S&C Electric Co.....6, 7
Sangamo Electric Co..... 143
Searchlight Section 174, 175
Simplex Wire & Cable Co..... 11
Socony-Vacuum Oil Co., Inc..... 15
Sorgel Electric Co..... 137
Southern States Equipment Corp.
50, 115
Sylvania Electric Products, Inc... 112

United States Rubber Co...22, 32, 33
Uptegraff Mfg. Co., R. E..... 111

Victor Insulators, Inc..... 147

Westinghouse Electric Corp..... 121
122, 123, 124, 125, 126, 127
128, 129, 130, 131, 132
Wheeler Reflector Co..... 135
Wiremold Company, The..... 156

■

PROFESSIONAL SERVICES.....173, 174

■

SEARCHLIGHT SECTION
(*Classified Advertising*)
H. E. Hilty, Mgr.

EMPLOYMENT
Positions Vacant 174
Positions Wanted 174
Selling Opportunities Wanted..... 175
Employment Services..... 174

EQUIPMENT
(Used or Surplus New)
For Sale 175

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DISTRIBUTION ENGINEER—Two competent experienced graduate Electrical Engineers, with approximately 10 years experience design, operation and maintenance of distribution facilities in established rapidly growing utility located South America. Reply giving resume education, experience and personal data. P-4097, Electrical World.

METER SUPERINTENDENT — Established rapidly growing utility in Brazil requires competent technician with 10 years experience Meter Department of U. S. or large Latin American Public Utility to supervise Meter Departments several operating companies. Single man preferred as considerable traveling involved. Reply giving resume education, experience and personal data. P-4098, Electrical World.

LOAD DISPATCHER — Established growing utility in one of most desirable locations in Brazil desires temporary services (about one year) of experienced technician to initiate dispatching service and train local personnel in its operation and maintenance. System is combination thermal and hydro with transmission up to 132 KV. Excellent opportunity for active retired experienced chief load dispatcher. Reply giving education, experience and personal particulars. P-4099, Electrical World.

POSITIONS VACANT

WANTED: YOUNG, graduate power engineers for utility office and field positions. Contact Electrical Engineer, Central Illinois Public Service Company, Springfield, Illinois.

ELECTRICAL ENGINEER — Junior or Assistant Distribution Engineer — technical graduate with at least 3 years field experience operating utility Company. Permanent position with long established consulting organization New York. Some travel Latin American necessary in future. Knowledge of Spanish or Portuguese useful. Salary commensurate with experience. Reply stating age, education, experience and personal particulars. P-4100, Electrical World.

ELECTRICAL ENGINEER—Technical graduate—at least 5 years experience on electrical maintenance and operating problems of generating stations and substations of public utility companies. Permanent position with long established consulting organization New York. Some travel Latin America. Spanish or Portuguese useful. Salary commensurate with experience. Reply stating age, education, experience and personal particulars. P-4101, Electrical World.

DISTRIBUTION ENGINEER—College graduate with at least ten years active experience in electric public utility distribution system design. Good starting salary. Address: P. O. Box #330, Hartford 15, Connecticut.

WATCH ENGINEERS and control operators capable of assuming full responsibility for operation of shift. New plant with pulverized fuel boilers and hydrogen cooled generating units. Location Eastern Indiana. Write P-4052, Electrical World.

STREET LIGHTING Engineer—to design street lighting luminaires and equipment and assist department manager. Must have B.S. degree and thorough knowledge of utility street lighting operation. Age 25 to 40. Salary open. Eastern Massachusetts. Please give complete information in first letter. P-3992, Electric World.

EMPLOYMENT SERVICE

SALARIED PERSONNEL, $3,000-$25,000. This confidential service established 1920, is geared to needs of high grade men who seek a change of connection under conditions assuring, if employed, full protection to present position. Send name and address only for details. Personal consultation invited. Jira Thayer Jennings, Dept. L, 241 Orange St., New Haven, Conn.

RE-NU-BUILT
GUARANTEED
ELECTRIC POWER EQUIPMENT
MOTOR GENERATOR SETS
3 ph., 60 cy.

Qu.	KW	Make	Speed	DC Volts	DC Volts
1	3000 3U	G.E.	514	600	4000/13200
2	2000/2400	G.E.	450	250/300	2300/4600
2	2000	G.E.	514	600	6600/13200
1	2000	G.E.	500	666 25 cy.	11500
2	2000	G.E.	450	600	2300/4600
1	1500	C.W.	514	115	4000/13800
1	1500	G.E.	720	600	13200
1	1000	G.E.	900	260	4100/6900
3	1000	G.E.	720	600	2300/4600
2	750	G.E.	720	275	2300/4600
1	500	Whse.	1200	125/250	2300
1	500	Whse.	900	250	440
1	500	G.E.	720	125	2300

TURBO GENERATORS

Qu.	KW	Make	Desc.
1	4000	G.E.	Condensing—425 lbs—750° F.T.T.—Surface Condenser 3/60/2300–4000 v with exciter
1	1000	G.E.	Non-Cond—190 lbs–2400–3–60
1	1000	Moore	Condensing — Extraction — 190 lbs., 2400–3–60—Surface Cond.
1	750	G.E.	Condensing—265 lbs., 440–3–60 Built 1944
1	500	Moore	Non-Cond—150/200 lbs., 5/35 lbs. B.P., 480–3–60 Dir. Conn Exciter.
1	300	G.E.	Non-Cond—150/175 lbs., 5/10 lbs. B. P., 480–3–60

FREQUENCY CHANGERS

Qu.	Kva	Make	Cycles	Voltages
1	13900	Whse.	60/25	13200 x 13200
1	3750	G.E.	60/25	4150/2400 x 2400/4150
1	3125	G.E.	25/60	4150/2400 x 2400/4156
2	2500	G.E.	25/62½	2300 x 4160
1	1250	G.E.	25/58.3	4400 x 2200
1	625	A.C.	25/60	11000 x 2300

TRANSFORMERS—60 Cycle

Qu.	KVA	Make	Type	Ph	Voltages
1	5000	Whse.	OISC	3	33000x26400/13200
1	2500	Whse.	OISC	3	26400/13200 x 480
3	2000	G.E.	HVDDJ	1	66000 x 13800
3	667	G.E.	HD	1	13800 x 2300
3	1250	G.E.	HVDDJ		6600/550
3	1000	G.E.	HVDDJ	1	2200/480

BELYEA COMPANY, INC.
51 Howell Street, Jersey City 6, N. Y.

NEW CONTACTORS
¼ and less of list price

Allen-Bradley Bulletin 702, Size 1, 4-pole enclosed, also 3-pole enclosed and 3-pole not enclosed electrically held contactors, 110 volt 60 cycle holding coils.

Cheek Manufacturing Company
Box 791, Hearne, Texas.

POSITIONS WANTED

SALES ENGINEER, B.S. & E.E., 30, married, 5 years experience contacting utilities, industrials for switchgear, transformers, rotating machinery, equipments for transmission and distribution. Desires sales or allied position with future East or Midwest. PW-3780, Electrical World.

ELECTRICAL ENGINEER, age 36, 15 years design & specifications commercial, industrial and chemical. Familiar all phases of electrical construction industry. Capable assuming complete charge. Impressive record of completed projects. Desire position with AAA firm or willing to free-lance on part time basis. Any phase considered, drawings, specifications, surveys and/or estimates. Willing to travel. PW-3762, Electrical World.

PRODUCTIVE SALES and Management experience, calling on utilities and distributors; handling distribution and transmission equipment and material. Eight years in Southeastern secton; wishes to relocate there, as employee or manufacturers representative. PW-3998, Electrical World.

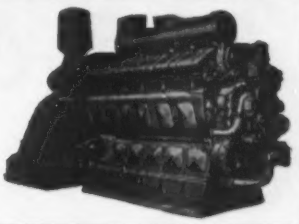
PROTECTIVE RELAY engineer. Experienced in power system analysis; protective relay applications, settings and testing. PW-4079, Electrical World.

ELECTRICAL ENGINEER, M.I.T. graduate, extensive experience in the design and engineering of industrial process projects, steam and hydro generating stations, high voltage substations, power system relaying, switchboards, switchgear and all types of industrial control equipment. PW-4141, Electrical World.

SELLING OPPORTUNITY WANTED

MANUFACTURER'S AGENT, covering utilities in Michigan, Ohio & Indiana, desires additional account. RA-4130, Electrical World.

DIESEL POWER



IMMEDIATE SHIPMENT
- **PURCHASE OR RENTAL**

UNIT CAPACITIES—10 TO 2475 KVA
A.C.—50 AND 60 CYCLES
- **ALSO D.C. UNITS**

A PARTIAL LISTING OF OUR INVENTORY

KW	Make	Model	HP	RPM	KW	Make	Model	HP	RPM
1150	Worthington	SEH-8	1685	360	400	Ingersoll-Rand	8-8	600	720
1136	Fairbanks Morse	38D	1600	720	350	Baldwin	VO-6	510	450
1100	General Motors	16-278A	1600	720	320	Enterprise	DSG-6	580	450
1000	General Motors	16-567B	1440	720	300	General Motors	8-268A	450	1200
750	General Motors	12-567	1080	720	200	General Motors	8-268A	350	900
700	Worthington	EE-8	1000	327	150	Worthington	CC-4	225	450
500	General Motors	8-278A	750	720	150	Ingersoll-Rand	8-4	225	600
500	General Motors	8-567	720	720	150	Buckeye	80	240	600
500	Alco	6-12 1x13T	750	600	100	General Motors	3-268A	150	1200
400	Sterling	VDS-8	600	1200	60	General Motors	6-71	90	1200

A. G. SCHOONMAKER COMPANY, INC.
DIESEL DIVISION, 50 CHURCH ST., NEW YORK 7, N. Y.

J. L. HEMPHILL & CO.
ELECTRICAL ENGINEERS & EQUIPMENT
1606 53rd ST. NORTH BERGEN, N. J. N.Y.C. Tel. LOngacre 5-3227 N. J. Tel. UNion 3-7600

TRANSFORMERS 60 CYCLE
2—3750 KVA G.E.—3 ph. (new) type OA outdoor 26,400 V., pri. 4360 V. sec.
3— 50 KVA Gen. Elec., Type H, 1/60, Pri. 460, Sec. 115/230.
3— 50 KVA Whse. Brand New. OISC, 1/60, Pri. 2400/4160Y, Sec. 240/480.
3—37½ KVA General Electric, Type H, 1/60, Pri. 2400/4160, Sec. 120/240.

SYNCHRONOUS MOTORS
1— 300 H.P., Elec. Mach., 720 RPM, 3 Phase 60 cyc., 2200V T E F Cooled Outdoor service.
1— 150 H.P., G.E., 1600 RPM, 220V, 3/60.
2— 150 H.P., Al. Chal 360 RPM, 440V, 3/60.

MOTOR GENERATOR SETS
1—1000 KW Whse., 600 V. 720 RPM. 4150 syn.
1—1000 KW G.E., 600 V. 514 RPM. 4000 Syn.
1— 750 KW Whse., 275 V. 720 RPM. 4000 Syn.
100 G.E. 250 V. 1200 rpm. S.R.
1— 200 KW Whse., 250 V., 900 RPM. 4000V. Syn.
1— 150 KW G.E., 128/250V. 1200 RPM 2300 Syn.

SLIP RING MOTORS
2— 500 H.P., G.E., M 1200 RPM 2400V.
1— 400 H.P., West., CW. 450 RPM. 550V.
1— 250 H.P., West., CW. 600 RPM. 440V.
1— 200 H.P., West., CW. 600 RPM. 440V.
3— 150 H.P., Al. Ch. 1800 RPM. 2300V., APH. 60 Cy.

Large Stock of A.C. and D.C. Equipment

ELECTRICAL WIRE AND CABLE

—Your Best Source—
- for every industrial and power application
- Odd lengths—long and short—reasonably priced
- **LARGEST STOCK IN MIDWEST**

Let us quote on requirements—
send your inquiries
We'll also buy your Surplus
Branch Offices:
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UNIVERSAL Wire and Cable Co.
2662 N. Clybourn Ave., Chicago 14, Ill.
EAstgate 7-4777 Code: UNIWIRE

250 HP, GE open motor, enclosed slip rings, 300 RPM, stub shaft, 2200 volt.
240 HP ,GE Synchronous motor, direct connected exciter, 600 RPM, 2200 volt.
2—150 KVA, GE Transformers, Type H, Form KD, 11500—230/460 volts, 5 & 10% Taps.

ZIMMERMAN ELECTRIC MACHINERY CO.
1815 E. Central Wichita, Kansas

60 CYCLE GRAPHIC INSTRUMENTS

7—West. GY 40 KW 115/5....$60.00
4—West. GY 40 Meg 115/5.... 60.00
15—GE CD 43 Watt 115/5..... 60.00

W. B. McCLURE
105 Stey Ave. Westmont, N. J.

TRANSFORMERS
FOR SALE

6—1000 KVA Mol 11500-2400/4160Y
3— 833 KVA G-E 35000—480
3— 500 KVA G-E 26400—240/480
5— 333 KVA W-H 38000-7200/12470Y
3— 333 KVA G-E 33000-2300/4000Y/6900/-11950Y
3— 333 KVA G-E 33000-2300/4000Y
3— 333 KVA Mol 7200/12470Y-2500/4160Y
3— 333 KVA W-H 6600-2300
3— 150 KVA G-E 19050/33000Y-2540/4000Y
5— 150 KVA G-E 7200/12470Y-240/480
3— 100 KVA G-E 33000-6900/11950Y
3— 100 KVA G-E 4000-115/230

Many other items in stock

TRANSFORMERS WANTED

Reliable rewind and repair service on all makes of transformers

THE ELECTRIC SERVICE CO.
Cincinnati 27, Ohio
40 Years Dependable Service

New and Used Equipment Available for
POWER PLANTS, SUBSTATIONS, TRANSMISSION LINES AND CONSTRUCTION
Send for new list to
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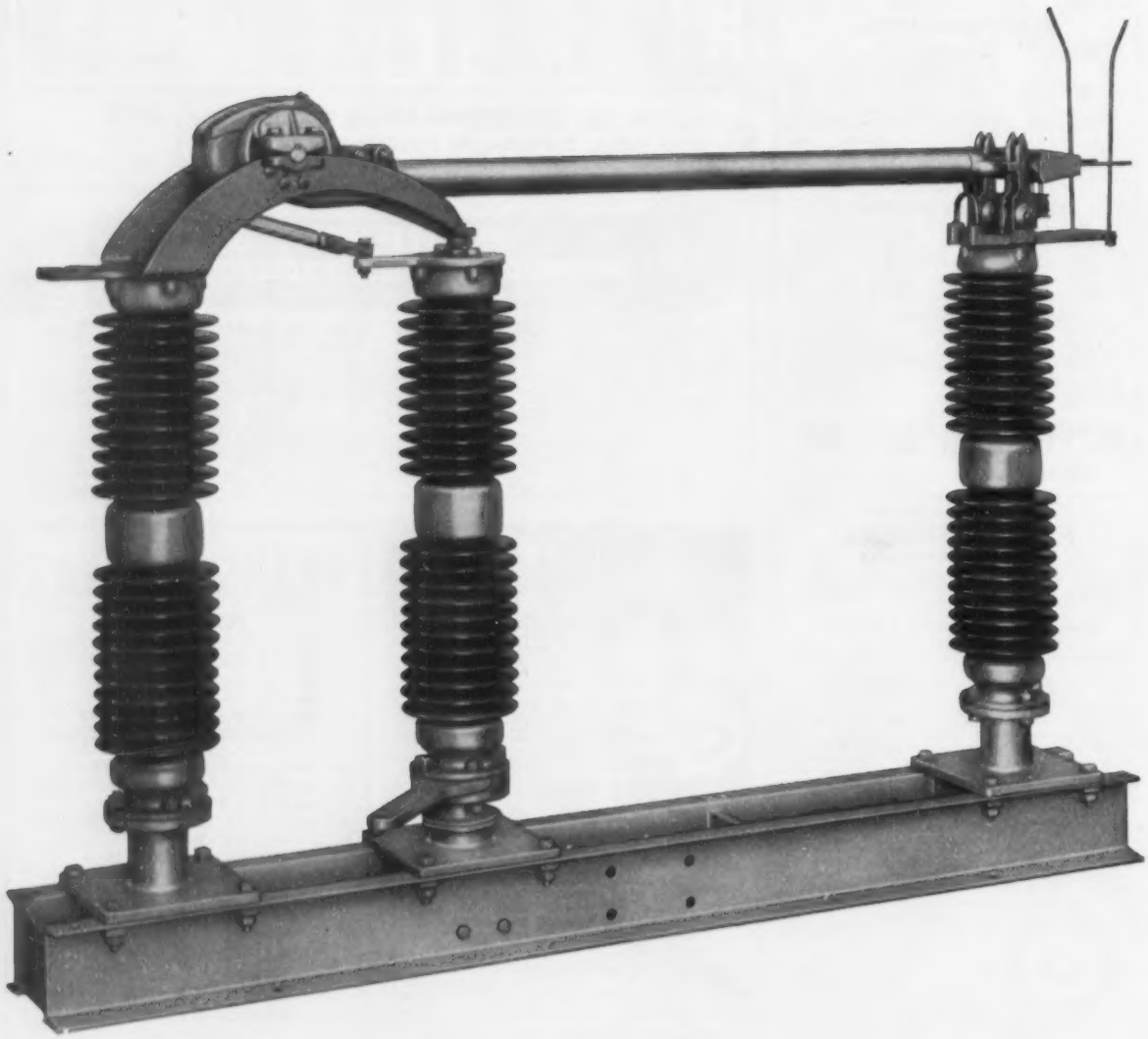
APPARATUS EXCHANGE Two Rector St., New York 6, N. Y.

Cole Electric Co.

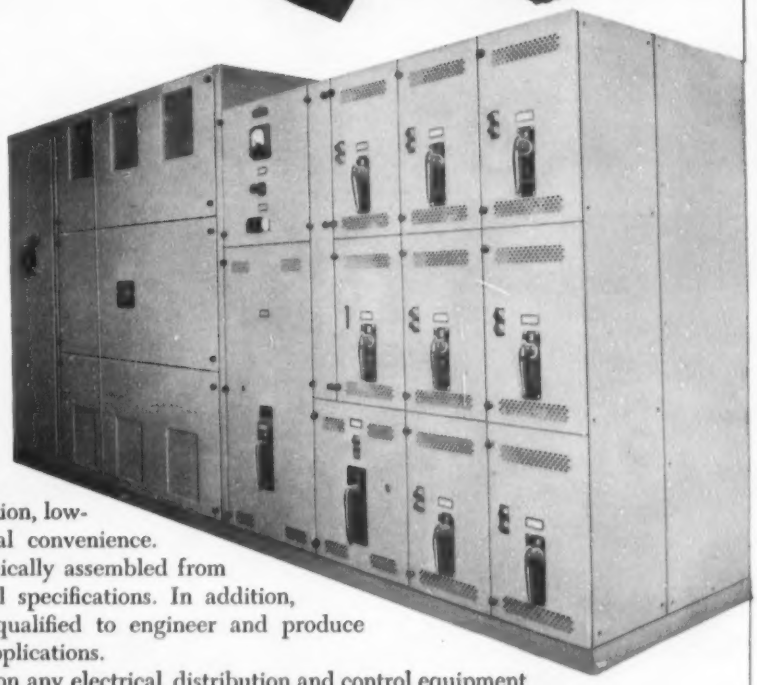
8439 Steller Drive | TExas 0-4701 | Culver City, Calif.



AIR BREAK DISCONNECTING SWITCH
69,000 Volts—1200 Amperes
Type 0-2
Vertical Break, Three Pole, Single Throw
Group Operated—One Pole Shown
HIGH PRESSURE SILVER TO SILVER CONTACTS
See Bulletin 46-A

IT'S FEDERAL PACIFIC EQUIPMENT FOR GRUMMAN'S NEW JET PLANT

At right, below... one of the 13 Federal Pacific Unit Substations with Federal Pacific Type DMB drawout circuit breakers in the electrical system of the new Peconic River plant... Electrical Contractors, Broadway Maintenance Corp., Long Island City, N. Y. and Charles A. Mulligan, Inc., Central Islip, N. Y.... Electrical Engineers, Guy B. Panero, New York City.



GRUMMAN AIRCRAFT ENGINEERING CORP., Bethpage, Long Island, N. Y., has recently occupied the Navy's new Peconic River plant designed for the assembly of the sweptwing, F9F-8 Cougar jet fighters. Modern to the last detail, the plant's distribution and control equipment for electric light and power is Federal Pacific throughout and includes 13 Unit Substations, 1500 feet of Plug-In Bus Duct, many Distribution Light and Power Panels, and a wide variety of miscellaneous devices.

Federal Pacific equipment is in a class by itself for ease of installation, low-cost maintenance, and operational convenience. Much of it is quickly and economically assembled from standard units to meet individual specifications. In addition, Federal Pacific is exceptionally qualified to engineer and produce equipment required for special applications.

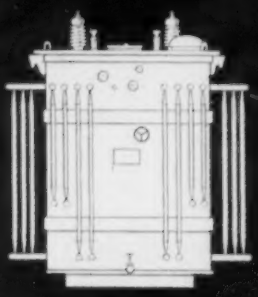
Write for descriptive literature on any electrical distribution and control equipment in which you are interested through the whole range from 110 to 300,000 volts... and submit any particular problems to us for study and recommendations.

FEDERAL PACIFIC ELECTRIC CO.

FORMERLY—FEDERAL ELECTRIC PRODUCTS COMPANY AND PACIFIC ELECTRIC MANUFACTURING CORP.

Main Office: 50 PARIS STREET, NEWARK 1, N. J.

Federal Pacific products: Stab-lok Circuit Breakers, Motor Controls, Safety Switches, Service Equipment, Industrial Circuit Breakers, Panelboards, Switchboards, Control Centers, Bus Duct, High voltage circuit breakers and power switches ★ Sales offices in principal cities.



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ENGINEERED TO WITHSTAND
HIGH OPERATIONAL STRESSES

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